SWRHL-74r

SOIL SURVEY OF AREA 18, NEVADA TEST SITE

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Public Health Service
Environmental Health Service
Environmental Control Administration
Bureau of Radiological Health

July 1970

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ABSTRACT

This soil survey of Area 18 of the Nevada Test Site was done in conjunction with a range survey by the Ecology Section (formerly named Agrology), Radiological Research Program, Southwestern Radiological Health Laboratory.

The purpose of the survey was to gather information on the soil and vegetation of Area 18 grazing range of the Atomic Energy Commission's (AEC) beef herd.

Physical and chemical analyses were performed on the soils. Twenty soil series descriptions were written for the different types of soils. Soils maps are included in the report.

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I. INTRODUCTION

During the last four years, considerable research has been conducted concerning the uptake and retention of radionuclides in various tissues of ruminant animals both cattle and deer. However, little or no information concerning the soil properties and concentration of radioactive isotopes in the soils which produces the feed for these animals is available as background information for long-range studies.

The purpose of this soil survey and report is to provide the basic soil information that will coincide with the range survey done by the Ecology Section (1).

A detailed study of this nature for a portion of the Nevada Test Site would aid in making a more accurate prediction of the radionuclide behavior in similar soils in the off-site areas.

In August of 1966, the soil survey was initiated by the Ecology Section of the Southwestern Radiological Health Laboratory to characterize the soils on the Area 18 range used by the AEC beef herd. This soil survey was designed to characterize the soil into the major soil series.

The soils were mapped on aerial photographs. Symbols representing features such as slope, erosion, runoff, depth, texture, and permeability were used to identify the mapping units.

II. DESCRIPTION OF AREA

A. Study Area.

The area surveyed lies predominantly in Township 9 South, Range 50 East, in Area 18 of the Nevada Test Site (see Fig 1). The boundaries of the study area are Buckboard Mesa to the west, the Pahute Mesa foothills to the north, Area 18 boundary on the east, and the foothills 1½ miles south of the Area 18 air strip. The total area encompasses approximately 28,153 acres. The topography of the area is variable. The valley washes, lying at about 4,800 feet elevation above sea level, are interrupted by numerous ridges rising to 6,200 feet elevation. Much of the area, especially to the north, occurs on alluvial fans originating from the Pahute Mesa front.

This area until recent years was used primarily for atmospheric nuclear testing. Three testing sites are noted to be within the boundaries. All three were part of the Department of Defense's Operation Storax.

These atmospheric tests were named and detonated as follows:

1. Little Feller II, July 7, 1962.
2. Johnny Boy, July 11, 1962.
3. Little Feller I, July 17, 1962.

B. General Geology.

Geology is one of the predominant factors in determining the type of soil found in an area.

The parent material of the soils in Area 18 of the Nevada Test Site has a great deal to do with the type of vegetation and vigor of the plants that are grazed by the U. S. Public Health Service's cattle in the area.

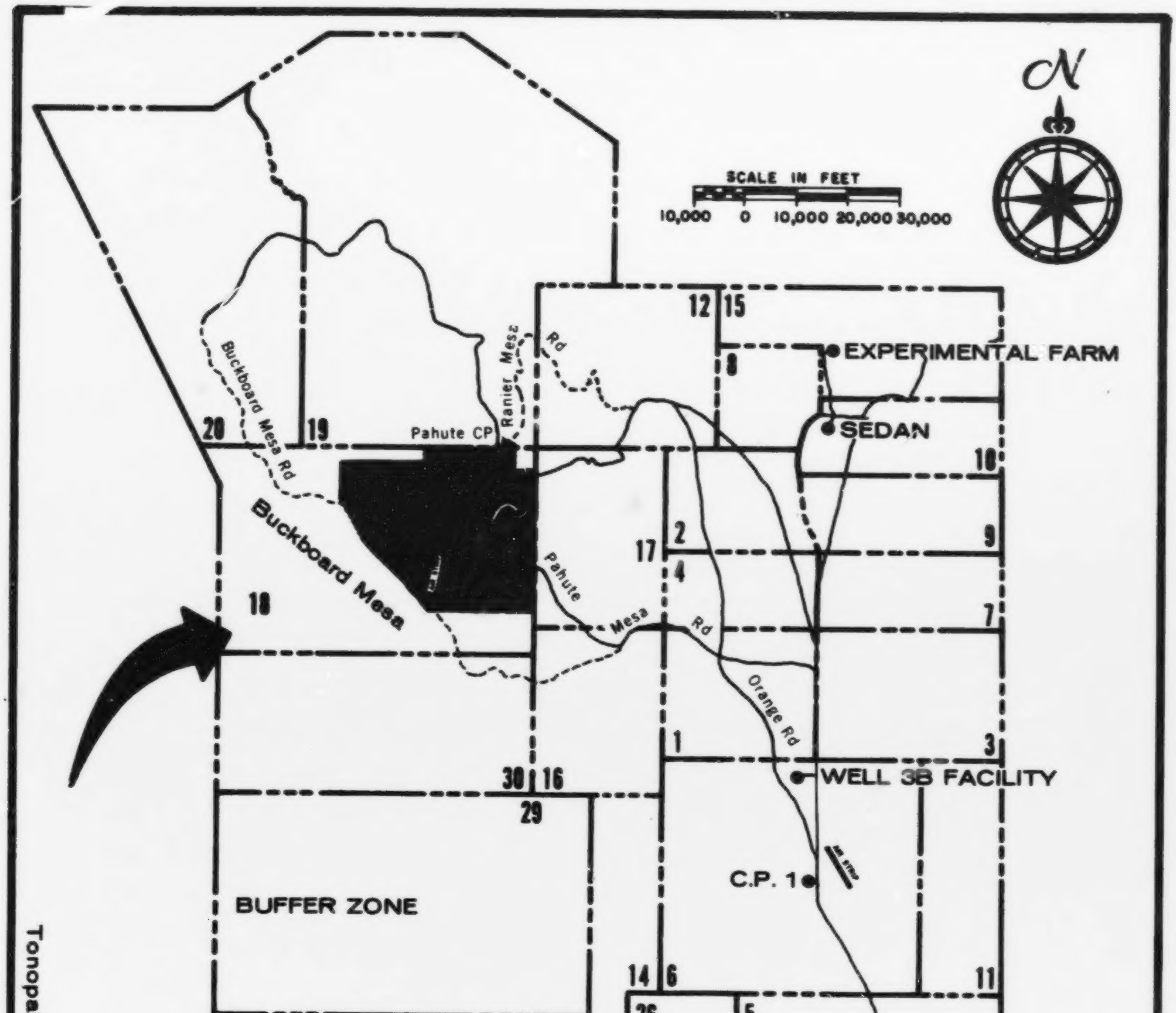
N
SCALE IN FEET
10,000 0 10,000 20,000 30,000
12
15
EXPERIMENTAL FARM
8
Buckboard Mesa Rd
Ranier Mesa Rd
20
19
Pahute CP
SEDAN
10
Buckboard Mesa
2
9
17
4
18
Pahute Mesa Rd
7
Orange Rd
1
3
30
16
WELL 3B FACILITY
29
C.P. 1
BUFFER ZONE
Tonopah (150 miles from Mercury)
14
6
11
26
5
Nuclear Rocket Development Station
N.R.D.S. BUFFER ZONE
27
Mercury Hwy
Las Vegas (65 miles from Mercury)
Jackass Flats Rd
25
28
22
23
MERCURY
Lathrop Wells
Hwy 95

FIGURE 1. LOCATION OF AREA 18 SURVEY IN NEVADA

The valleys in Area 18 are bordered and completely enclosed by mountains composed of Paleozoic, Mesozoic, and Tertiary rocks.

These rocks are complexly folded and faulted and are well consolidated. They include rocks of sedimentary and igneous origin (2).

The bedrock includes Paleozoic limestone and dolomite; lesser amounts of shale and sandstone; and Tertiary volcanic rocks, which consist of tuff or other pyroclastics, welded tuffs, and flows. These rocks crop out in the mountains and underlie the valley fill.

The valley fill includes deposits that range in age from Tertiary to Quaternary. The fill material includes rock debris, which has been eroded from surrounding mountains, and the pyroclastic deposits of tuff, welded tuff, and sedimentary deposits. The deposits of the Quaternary age consist mostly of unconsolidated clay, silt, sand, and gravel. They were deposited under subaerial and lacustrine environments and were largely derived by erosion of the Tertiary rocks in the mountains. The rocks of Tertiary age, underlying the Quaternary deposits, are believed to be similar in character to the Tertiary rocks exposed in the mountains (3).

C. Bedrock in the Mountains.

The Paleozoic rocks of the Bare Mountain probably are representative of the older rocks that crop out elsewhere in the soil survey area. The dominant rock types are limestone and dolomite with subordinate amounts of clastic rocks principally in the upper and lower parts of the Paleozoic section. Paleozoic rocks also crop out to a smaller extent elsewhere in the area, such as in the Grapevine Mountains, at Stonewall Mountain, and in the vicinity of Tolicha Peak and Quartz mountain. Tertiary volcanic rocks are the dominant rock type exposed in the mountains bordering Sarcobatus Flats and Oasis Valley. In the Bare Mountain area, 6,000 feet of Tertiary volcanic rocks, including lava flows, welded tuffs, tuffs, and other pyroclastics that range in composition from dacite to rhyolite but locally are basalt have been described (3).

One source indicates that granitic intrusive rocks probably underlie Stonewall Mountain, Tolicha Peak, and Quartz Mountain, on the basis of granitic inclusions found locally in the Tertiary volcanic rocks (3).

Four principal periods of deformation in the structural history of rocks in the Bare Mountain area have been described (3).

1. Folding, probably in the middle or late Paleozoic time.
2. Intense thrust faulting and lateral faulting, probably in Mesozoic time.
3. Moderate thrusting and normal faulting in middle or late Tertiary period.
4. Normal faulting from late Tertiary to recent times.

D. Climate.

There are no records of climatic conditions in this immediate area; however, the following information was recorded from surrounding areas. The study area can be classified as being semi-arid. Precipitation, from 4 to 12 inches per year, tends to be more abundant in the nongrowing seasons. Rains are at times localized; therefore, monthly rainfall may vary considerably from year to year. Snow commonly falls during the winter, but does not remain on the ground for long periods.

Temperatures in the study area can be classified as being extreme. Seasonal temperature fluctuations commonly vary between 10°F to 100°F.

Area 18 is characterized by low humidity, abundant sunshine, cool winters and warm dry summers. Freezing weather occurs frequently, but extremes of cold are not usual. Table 1 gives temperature and precipitation data compiled from records of the Environmental Science Services Administration (ESSA) at NTS.

The mean annual temperature at Area 18 is 55°F; the mean for the summer months is 78°F. The absolute maximum recorded is 104°F, and the absolute minimum is +1°F. The growing season, or frost-free

Table 1. Temperature and Precipitation Data

Data from the ESSA at Nevada Test Site (elevation 5,428 feet). Based on 3 years (1961 to 1963) for temperature and 7 years (1961 to 1967) for rainfall.

	Temperature			Rainfall		
Month	Average °F	Maximum °F	Minimum °F	Average Inches	Driest year 1966 Inches	Wettest 1965 Inches
Jan	37	44	29	0.31	0.23	0.29
Feb	42	52	33	0.47	0.24	0
Mar	42	53	31	0.40	0.02	1.12
Apr	51	65	37	0.64	0.01	2.69
May	61	71	51	0.20	0	0.37
Jun	66	78	54	0.34	0.09	0.14
Jul	74	87	61	0.71	0.86	0.65
Aug	74	86	61	0.74	0.56	0.77
Sep	66	79	53	0.99	0.67	0
Oct	59	71	47	0.12	0	0.01
Nov	46	57	36	0.75	0.02	2.42
Dec	40	52	29	0.80	1.28	2.17
Year	54.8	66.2	43.5	6.47	3.98	10.63

period, varies somewhat but is approximately 150 days. Generally, the first killing frost occurs early in October and the last killing frost occurs in May.

The rainfall ordinarily is insufficient for optimum growth for the range plants. Most of the rain and snow falls in the winter. Rainfall in that season is usually gentle, and little, if any, of the water runs off. In summer and early in the fall, local thunderstorms and cloudbursts cause flash floods. Although large quantities of water fall during these storms, runoff is slow and the soils slightly erode.

Winds of high velocity occur frequently and at all times of the year but are more common in the spring. The prevailing winds are from the north and northwest in the winter and from the south in the spring and summer.

E. Vegetation.

The vegetation in Area 18 is typical of that found in semi-arid areas of the Southwest.

A good stand of desert shrub and grass vegetative cover is present on the soils. The vegetative cover normally has a plant density of 10 to 25 percent on the excessively to well-drained soils. The vegetative cover contributes little organic matter to the soil, affords little protection against erosion, and provides little shade for the soil. High temperature, limited shade and low organic matter content have resulted in an adverse habitat for soil microorganisms.

The vegetation in Area 18 consists predominantly of big sage (*Artemisia tridentata*), Nevada joint-fir (*Ephedra nevadensis*), black sage (*Artemisia arbuscula* subsp. *nova*), and four-winged saltbush (*Atriplex canescens*). Other common species that occur are wolfberry (*Lycium andersonni*), galleta grass (*Hilaria jamesii*), squirrel tail grass (*Sitanion hystrix*), Indian rice grass (*Orhyzopsis hymenoides*), spiney hop-sage (*Grayia spinosa*), black bush (*Coleogyne ramosissima*) desert needlegrass (*Stipa speciosa*), cliff rose (*Cowania mexicana* var. *stansburiana*), and a large number of species of buckwheat.

III. SOIL MAPPING PROCEDURES

The soil survey was mapped according to the United States Department of Agriculture 1960 Soil Classification and the 7th Approximation System. Soil pits were dug with a backhoe and by hand.

The survey was plotted on aerial photographs, copies of which are found in Appendix VI.

Soil samples were taken when the soil pits were described. Physical and chemical analyses were run on the samples in the soils laboratory. The results are found in Appendix II and III, respectively.

Chemical analysis of the soil is used in many cases to determine the series of a soil. For example, one soil may have 5 to 15 percent calcium carbonate and another may have 15 to 40 percent with all other features the same. These two samples, however, would be classified as two separate series because of the percentage of calcium carbonate.

IV. DESCRIPTIONS OF SOIL PROFILES

This section describes the soil series of the study area. For each soil series, a profile of a soil representative of the series is described. Rock land does not belong to a soil series, nevertheless, it is listed in alphabetical order along with the soil series.

Unless otherwise stated, the profile of the representative soil described has been located in an undisturbed area. The color of each soil horizon is described in words, such as light brownish gray but it may also be indicated by symbols for the hue, value, and chroma, such as 10YR 6/2. These symbols, called Munsell color notations, are used by soil scientists to evaluate the color of the soil precisely. Unless noted otherwise, the pH is determined by using soil and water in a ratio of 1 to 1.

Following is an alphabetical listing of the soil descriptions:

- Bare
- Beatty
- Big Butte
- Buckboard
- Bullfrog
- Echo
- Eleana
- Halfpint
- Hampel
- Indian Springs
- Keane Spring
- Oak Spring
- Pahute
- Ruddle
- Sawtooth
- Scranton
- Timber
- Timpahute
- Tippipah
- Wildcat

Many terms used in the soil descriptions and other sections of the survey are defined in the Glossary, Appendix VII.

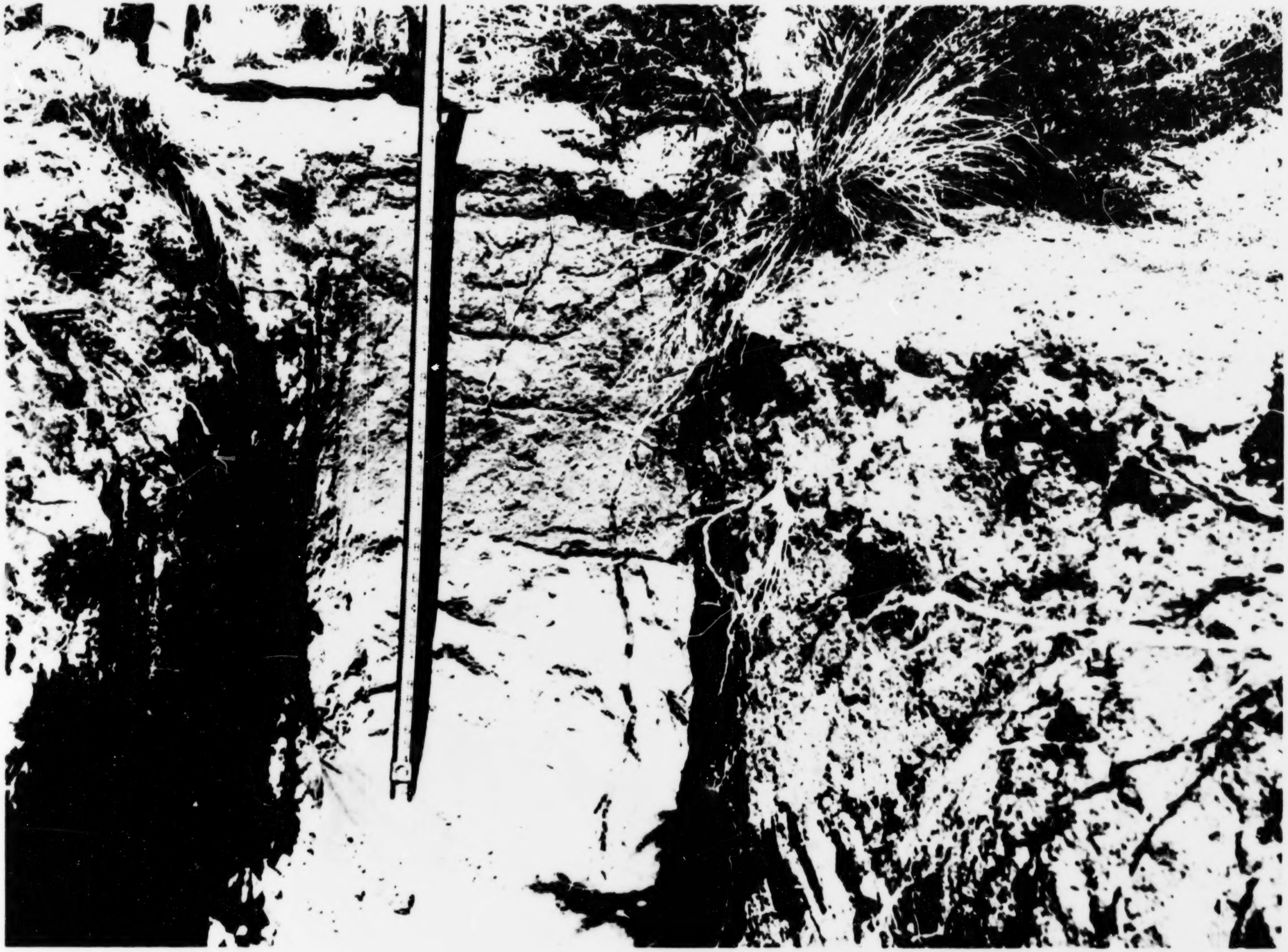

FIGURE 2. Typical profile of Bare series
(Hole #38; 1gS5-Ba, BaBs; Duric Mollic Camborthids.)

BARE SERIES

Survey Hole No. 35

The Bare series is a member of a loamy skeletal, mixed, mesic family of Duric Mollic Camborthids. The Bare soils have light brownish gray A1 horizons with about 1 percent organic matter. They are calcareous throughout.

Typifying Pedon: Bare gravelly fine sandy loam (virgin)
(Color for dry conditions unless otherwise noted.)

A1 0 to 6 inches -Light brownish gray (10YR 6/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine and very fine roots; common medium and fine tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (2 to 8 inches thick.)

C1 6 to 12 inches -Brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure, soft, friable, nonsticky, nonplastic; plentiful fine and medium roots; common fine and medium tubular and interstitial pores; strongly effervescent; moderately alakline (pH 8.0); clear smooth boundary. (4 to 10 inches thick.)

C2 12 to 18 inches-Pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; plentiful fine and medium roots; common fine and medium tubular pores; strongly effervescent, moderately alkaline (pH 7.8); clear wavy boundary. (4 to 12 inches thick.)

C3sica 18 to 50 inches +-Light yellowish brown (10YR 6/4) sand with white (10YR 8/1) silica streaks, brown (10YR 4/3) moist, silica-lime coatings on all cobbles and gravel, massive, loose when dry and moist; nonsticky, nonplastic; abundant fine and very fine roots; few fine and medium interstitial pores; violently effervescent; moderately alkaline (pH 7.8).

Type Location: About 500 feet northwest of Well 8 just out of a wash and 150 feet south of range cattle corral in Area 18.

Range in Characteristics: Average annual soil temperature at 20 inches is less than 71°F and greater than 59°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues of 10YR values of 5 or 6 dry and 3 or 4 moist, and chromas of 2 or 3. Texture of the control section includes fine sandy loam and loam modified by gravel and cobbles. Coarse fragments range from 30 to 40 percent. Organic matter content of the surface 12 inches or less after mixing, is less than one percent. Few or common, fine to coarse silica-lime segregations occur in C3 horizon, and the gravel and cobbles are coated by silica-lime in cracks and on its surface, or both. Reaction of the profile ranges from 7.8 to 8.2.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Bare soils are on smooth recent alluvial fans with slope gradients from 2 to 8 percent. They have developed in residium from basalt and tuff at elevations of 4,800 to 5,200 feet. The climate is warm to semi-arid having a mean annual precipitation ranging from 6 to 8 inches and mean annual air temperature of about 52°F. The average January temperature is about 38°F and the July temperature is about 71°F. The average frost-free season is about 130 to 150 days.

Principal Associated Soils: Common associates of the Bare series, are Beatty, Buckboard, and Rainier. Beatty soils differ by being free from silica-lime cementation in the C3 horizon. Buckboard soils differ by having a fine-textured shallow profile. Rainier soils differ by having duripans.

Drainage and Permeability: Well drained. Surface runoff is slow to very slow. Permeability is rapid.

Use and Vegetation: These soils are used to provide low producing livestock grazing. The vegetation consists of big sage (*Artemisia tridentata*), cliff rose (*Cowania mexicana* var. *nova*). Nevada joint-fir (*Ephedra nevadensis*), big rabbitbrush (*Chrysothamnus teretifolius*) juniper (*Juniperus osteosperma*), small rabbitbrush (*Chrysothamnus viscidiflorus*), pinyon pine (*Pinus monophylla*), giant wildrye (*Elymus condensatus*), black sage (*Artemisia arbuscula* subsp. *nova*), squirrel tail (*Sitanion hystrix*), four-winged saltbush (*Atriplex canescens*), and desert needlegrass (*Stipa speciosa*). The total plant density is approximately 10 percent.

Distribution and Extent: Bare soils are known to occur on the Nevada Test Site, but may occur in other valleys of central Nevada. These soils are not extensive.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Bare is the name of a mountain near the Nevada Test Site.

BEATTY SERIES

Survey Hole No. 6

The Beatty series is a member of a sandy skeletal, mixed, nonacid, mesic family of Typic Torriorthents. Typically Beatty soils are brown or light gray, calcareous and have very gravelly and sandy control sections.

Typifying Pedon: Beatty gravelly sandy loam (virgin)
(Colors for dry conditions unless otherwise noted.)

A1 0 to 5 inches -Brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; very weak fine subangular blocky structure; soft, very friable. nonsticky, nonplastic; abundant fine and very fine roots; common fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (1 to 10 inches thick.)

C1 5 to 18 inches-Brown (10YR 5/3) gravelly sand, grayish brown (10YR 4/2) moist; massive, soft, very friable, nonsticky, nonplastic; plentiful fine and medium and few coarse roots; many fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.4); clear smooth boundary. (12 to 14 inches thick.)

C2 18 to 45 inches-Light gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) moist; single grain; loose when dry and moist; plentiful fine and medium roots; many fine and very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary. (15 to 25 inches thick.)

C3 45 to 60 inches+-Very pale brown (10YR 7/3) gravelly loamy sand; grayish brown (10YR 5/2) moist; single grain; loose when dry and moist; few fine and very fine roots; many fine and very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.6).

Type Location: The site is approximately 1.5 miles south of the airport junction along the highway going to Well 3 and 800 feet north of the highway in a large wash.

Range in Characteristics: The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues of 10YR and 7.5YR, values of 5 to 7 dry and 3 to 5 moist, and chromas of 2 to 4. Occasionally the A1 horizon may be at least one-half unit of value darker, either moist or dry, than the remainder of the profile. Texture of the control section is predominantly sandy loam, loamy sand modified by gravel. The coarse fragments range from 50 to 90 percent, with gravel predominating. Gravel ranges from 30 to 65 percent, cobbles up to 10 percent, and stones up to 5 percent. Lime content is variable from one strata to another but is always at least effervescent. Occasional thin silica-lime coatings may occur on some gravel undersides in the C2 horizons. The pH values of the profile range from 8.2 to 8.6.

Competing Series and Their Differentiae: There are no other series in the same family at the present time. Other similar soils include Carrizo, Cajon, Bluewing, Brazito, Niland, Tujunga, Arizo, and Soboba. Carrizo soils differ by having a mean annual soil temperature greater than 71.6°F. Cajon soils are sandy throughout, lacking the gravel content that is common through the Beatty soils. Bluewing soils differ in having a Cca horizon. Brazito soils have fine sand or sand control sections. Niland soils differ by containing fine textured materials at depths less than 40 inches. Tujunga soils differ by being neutral and noncalcareous, and containing less than 50 percent coarse fragments in the control section. Arizo soils differ by having more coarse fragments in the profile. Soboba soils differ by being noncalcareous and neutral, and have mean annual soil temperatures that are greater than 71.6°F.

Setting: Beatty soils occur at elevations of about 4,000 to 5,500 feet on nearly level to moderately sloping recent alluvial fans. Slope gradients are generally between 2 to 4 percent but range upward to 8 percent. These soils have developed in very gravelly sandy alluvium derived foom mixed rock sources including tuff, basalt, Rhyolite, granite, limestone, and older valley-fill material. The climate is semi-arid with mean annual precipitation of 6 to 12 inches. Mean annual temperature is about 52°F; in January it is about 38°F, and in July about 71°F. The frost-free season is from 130 to 150 days. These soils are not extensive in Area 18.

Principal Associated Soils: Common associates of the Beatty soil are Rainier, Buckboard, and Tippipah. The Rainier soils differ by having duripans. Buckboard soils differ by having a fine-textured shallow profile. Tippipah soils differ by having thick B horizons.

Drainage and Permeability: Well to excessively drained. Surface runoff is very slow. Soil permeability is very rapid.

Use and Vegetation: These soils are used to provide low producing livestock grazing. The vegetation consists of big sage (*Artemisia tridentata*), buckwheat (*Eriogonum maculatum*), desert needlegrass (*Stipa speciosa*), four-winged saltbush (*Atriplex canescens*), small rabbitbrush (*Chrysothamnus viscidiflorus*), Indian ricegrass (*Oryzopsis hymenoides*), squirrel tail (*Sitanion hystrix*), and loco weed (*Astragalus lentiginosus*).

Distribution and Extent: Beatty soils are known to occur on the Nevada Test Site, but may occur in other valleys of central Nevada.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Beatty is the name of a small town near the test site.

Remarks: These soils are classified as Typic Torriorthents, member of a sandy skeletal, mixed, nonacid, mesic family in accordance with the 7th Approximation (compare with Leo series).

BIG BUTTE SERIES

Survey Hole No. 26

The Big Butte series is a member of fine loamy, mixed, mesic family of Lithic Argixerolls. Big Butte soils typically have grayish brown A1 horizons, strong coarse subangular block B horizons and are shallow over basalt bedrock. They are slightly calcareous throughout.

Typifying Pedon: Big Butte gravelly fine sandy loam (virgin) (Colors for dry conditions unless otherwise noted.) The soil surface is covered with large boulders, gravel and cobbles (desert pavement).

A1 0 to 3 inches -Grayish brown (10YR 5/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, friable, nonsticky, nonplastic; very few fine and very fine roots; many fine and medium tubular pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (2 to 6 inches thick.)

B1 3 to 10 inches -Reddish brown (5YR 4/3) gravelly fine sandy loam, dark reddish brown (5YR 3/2) moist; strong coarse subangular blocky structure; hard, friable, sticky, plastic; plentiful fine amd medium roots; common fine and medium tubular pores; common thin clay films on peds and in pores; slightly effervescent; mildly alkaline (pH 7.8); clear smooth boundary. (3 to 8 inches thick.)

B2 10 to 13 inches+-Dark reddish gray (5YR 4/2) gravelly loam, dark reddish brown (5YR 3/2) moist; strong coarse subangular block structure; hard, friable, very sticky, very plastic; very few fine and medium roots; common fine and medium tubular pores;

many moderately thick clay films in tubular pores; slightly effervescent, mildly alkaline (pH 7.8).

R 13 inches+-Basalt Bedrock

Type Location: One mile northwest of Pahute Control Point on the slope of a low terrace.

Range in Characteristics: Average annual temperature immediately above bedrock is less than 59°F and greater than 47°F. The soil is usually dry for more than 60 consecutive days during most years, mainly during the late summer and early fall months. Mineralogy is mixed. Depth to extremely hard bedrock ranges from 12 to 20 inches. Color of the soil profile, except for the bedrock, includes hues of 10YR and 5YR, values of 4 or 5 dry and 3 moist, and chromas of 2 or 3. Textures of the control section include loam, sandy clay loam, and clay modified by gravel. Coarse fragments range from 50 to 75 percent. Stones and cobbles range up to 25 percent and gravel may range from 30 to 50 percent. The pH of the soil profile may range from 7.4 to 8.0. Clay films in the B horizons range from common thin to many moderately thick films.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Big Butte soils occur on gently to moderately sloping low terraces with slope gradients between 2 and 8 percent. They have developed in residuum from basalt, tuff, and limestone at elevations between 4,800 and 5,200 feet. The average annual precipitation ranges from 6 to 8 inches. The climate is semi-arid with a mean annual air temperature of about 52°F, the average January temperature is 38°F and July is about 71°F; the frost-free season lasts 130 to 150 days.

Principal Associated Soils: Common associates of the Big Butte soils, are Pahute, Timpahute, Eleana, and Keane Spring. The Pahute soils differ by having a silica-lime hardpan. Timpahute soils differ by having strongly cemented indurated silica-lime hardpans. Eleana soils differ by having a gravelly silica-lime cemented pan. Keane Spring soils differ by having a dark loamy sand control section.

Drainage and Permeability: Well drained. Runoff is medium to rapid depending on slope and vegetative cover. Permeability is slow to bedrock and very slow to impermeable through the bedrock.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation has a plant density of approximately 15 percent and consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), Nevada joint-fir (*Ephedra nevadensis*), juniper tree (*Juniperus osteospherma*), small rabbitbrush (*Chrysothamnus viscidiflorus*), and traces of pinyon pine (*Pinus monophylla*), squirrel tail (*Sitanion hystrix*), brome grass (*Bromus tectorum*), Spanish bayonet (*Yucca baccata*), Indian ricegrass (*Oryzopsis hymenoides*), Nevada bluegrass (*Poa nevadensis*), wolfberry (*Lycium andersonii*), cacti (*Opuntia basilaris*), and globe mallow (*Sphaeralcea grossulariaefolia*).

Distribution and Extent: These soils are of limited extent in the Area 18 soil survey of the Nevada Test Site, Nye County, Nevada, 1967. Big Butte is the name of a large hill near the Nevada Test Site.

BUCKBOARD SERIES

Survey Hole No. 8

The Buckboard series is a member of fine loamy, mixed, mesic family of Haplic Durorthids. The Buckboard soils typically have weak platy A1 horizons and may have vesicular coarse platy A2 horizons, and are very shallow to shallow over silica-lime hardpans which may be discontinuous.

Typifying Pedon: Buckboard fine sandy loam (virgin)
(Color for dry conditions unless otherwise noted.)
Surface covered with gravel, cobbles and few stones.

A1 0 to 4 inches-Light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak coarse platy breaking to moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; plentiful fine and very fine roots; few fine tubular and interestitial pores; slightly effervescent; moderately alkaline (pH 8.0) clear smooth boundary. (1 to 6 inches thick.)

B1 4 to 13 inches-Pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; plentiful fine and very fine and few medium and coarse roots; common fine tubular and interstitial pores; strongly effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (2 to 10 inches thick.)

C1sica 13 to 14 in-White (10YR 8/1) silica-lime pan, light gray (10YR 7/2) moist; massive, very firm; dry and moist; nonsticky, nonplastic; no roots or pores; violently effervescent, moderately alkaline (pH 8.4) clear wavy boundary. (1 to 15 inches thick.)

C2 14 to 48 inches+White (10YR 8/1) very coarse sand, light gray (10YR 7/2) moist; massive; hard, friable, nonsticky, nonplastic; few fine and medium roots; strongly effervescent, moderately alkaline (pH 8.3). There are a number of silica-lime seams running through this horizon approximately 1 inch thick.

Type Location: The site is located on the north side of a hill 400 feet west of Pahute Mesa Highway and 1.2 miles south of the junction of Pahute Mesa Highway and Area 12 Highway, Area 18.

Range in Characteristics: Average annual temperature immediately above the hardpan ranges from 59°F to 71°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Depth to hardpan ranges from 5 to 18 inches. Color of the soil includes hues of 10YR and 5YR, values of 6 or 8 dry and 4 or 7 moist, and chromas of 2 or 3. The organic matter content of the upper 4 inches, after mixing will not exceed one percent. Textures of the control section include gravelly loam, light sand clay loam, or very coarse sand modified by gravel or cobbles. Coarse fragments range from 30 to 50 percent. Gravel ranges from 25 to 35 percent, cobbles range up to 15 percent and stones may range up to 5 percent. The C2 horizons may contain several very thin (1 to 3 inch thick) weakly silica-lime-cemented lenses similar to the Cca horizon. The pH values range from 8.0 to 8.8, with the highest value usually occurring in the Cca horizons.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Buckboard soils occur on strongly dissected old alluvial fans with smooth to slightly convex, gently sloping (2 to 4 percent gradient) tops and regular, moderate to steep sloping (4 to 20 percent gradient) side slopes. These soils have developed in highly silicate alluvium derived mainly from tuff with some admixture from basalt, rhyolite and limestone and other sedimentary rocks. The climate is semi-arid, having a mean annual precipitation of 6 to 8 inches. The temperatures are warm, having a mean annual temperature of about 52°F; the January mean is about 38°F and in July is about 71°F; the frost-free season is 130 to 150 days.

Principal Associated Soils: Common associates of Buckboard soils are the Beatty, Rainier and Tippipah series. The Beatty series differs by having a very deep gravelly profile. The Rainier soils differ by having clay textured B2 horizons. Tippipah soils differ by having thick B2 light clay horizons.

Drainage and Permeability: Well drained. Surface runoff is rapid because of slope. Soil permeability is moderate.

Use and Vegetation: These soils are used to provide low producing livestock grazing. The vegetation has a plant density ranging from 10 to 20 percent and consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), Nevada joint-fir (*Ephedra nevadensis*), spiny hop-sage (*Grayia spinosa*), squirrel tail (*Sitanion hystrix*), globe mallow (*Sphaeralcea grossulariaefolia*), Indian ricegrass (*Oryzopsis hymenoides*), and four-winged saltbush (*Atriplex canescens*).

Distribution and Extent: These soils are extensive in Area 18, but may occur in other adjacent areas in central Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Buckboard is the name of a mesa within the test site area.

BULLFROG SERIES

Survey Hole No. 13

The Bullfrog series is a member of a fine, montmorillonitic mesic family of Haplic Mollic Durargids. The Bullfrog soils have brown A1 horizons containing a fair amount of organic matter. Cca horizons are within 24 to 40 inches of the surface, parent materials are primarily basalt, tuff, and limestone and are calcareous throughout.

Typifying Pedon: Bullfrog gravelly and cobbly loam (virgin) (Colors for dry conditions unless otherwise noted.) The soil surface is cobbly and stony. The exposed surfaces have a burnished desert varnish.

A11 0 to 9 inches-Brown (10YR 5/3) gravelly and cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; abundant very fine and fine roots; many fine tubular and interstitial pores; strongly effervescent, strongly alkaline (pH 8.6); clear smooth boundary. (1 to 10 inches thick.)

A12 9 to 20 inches-Pale brown (10YR 6/3) gravelly and cobbly loam with white (10YR 8/2) lime streaks, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; plentiful fine and medium roots; many fine and medium tubular and interstitial pores; lime coatings on all sides of cobbles; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (6 to 12 inches thick.)

B2 20 to 40 inches-Light reddish brown (5YR 6/4) clay loam with white (10YR 8/2) lime streaks, reddish brown (5YR 4/3) moist; strong coarse prismatic structure; slightly hard, friable, sticky, plastic; few fine and very fine roots; many fine and medium tubular and interstitial pores; many thin clay films on peds and in pores; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary. (10 to 24 inches thick.)

Clsica 40 inches+-White (10YR 8/2) silica lime pan, light gray (10YR 7/2) moist; massive; very firm dry and moist, nonsticky, nonplastic, violently effervescent, moderately alkaline (pH 8.4).

Type Location: The site is in Area 18 and is approximately ½ mile north of road going to Buckboard Mesa and 300 feet east of the top of the Buckboard Mesa on the hill slope.

Range in Characteristics: Depth to hard pan ranges from 24 to 40 inches. The soil profile pH values range from 8.2 to 8.6 and are usually highest in the horizon immediately above the lime hardpan. Average annual soil temperature at a depth of 20 inches or immediately above the lime hardpan is less than 59°F and more than 47°F. The soil is usually dry for 6 months or more during most years, mainly during the spring and fall months. The mineralogy is mixed. Organic matter content of the A1 horizon is less than 1 percent. Color of the soil profile, except for the Ccs horizons, includes hues of 10YR and 5YR, values of 5 or 6 dry and 3 or 4 moist, and chromas of 2 or 3. The color of the Ccs horizons includes hues of 10YR values of 8 dry and 7 moist, and chromas of 1. Textures of the control section include loam, clay and silty clay loam modified by gravel and cobbles.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Bullfrog soils occur on steeply sloping hillsides of Buckboard Mesa that are 15 to 45 percent gradient. These soils have developed from mixed alluvium derived mainly from basalt with some admixture from tuff, limestone, and other sedimentary rocks. The climate is semi-arid, having a mean annual precipitation of

6 to 8 inches. The temperatures are warm, having a mean annual temperature of about 52°F, a January mean temperature of 38°F and July about 71°F, the frost-free season is from 130 to 150 days.

Principal Associated Soils: Common associates of Bullfrog soils are the Buckboard, Ruddle, and Bluewing series. The Buckboard soils differ by being shallow over a silica-lime hardpan. Ruddle soils differ by having a deep soil profile and no Cca horizon. Bluewing soils differ by having a sandy skeletal control section.

Drainage and Permeability: Moderately well to well drained. Surface runoff is medium to rapid depending on the slope. Permeability is moderately slow.

Use and Vegetation: These soils are used for range having fair carrying capacity. The vegetation consists of galleta grass (*Hilaria jamesii*), globe mallow (*Sphaeralcea grossulariaefolia*), Russian thistle (*Salsola kali*), buckwheat (*Eriogonum maculatum*), four-winged saltbush (*Atriplex canescens*), green fire (*Menodora spinescens*), horsebush little-leaf (*Tetradymia glabrata*), black bush (*Coleogyne ramosissima*), and desert needlegrass (*Stipa speciosa*). The plant density is about 20 percent.

Distribution and Extent: Mapped in Area 18, but may occur in other valleys of central Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Bullfrog is the name of a hill near the Nevada Test Site.

ECHO SERIES

Survey Hole No. 32

The Echo series is a member of fine loamy mixed mesic family of Lithic Mollic Haplargids. Echo soils typically have pale brown A2 horizons, moderate medium subangular blocky B horizons and are shallow over basalt bedrock. They are slightly calcareous throughout.

Typifing Pedon: Echo gravelly loam (virgin)
(Colors for dry conditions unless otherwise noted.)
The soil surface is covered with a strong desert pavement of large boulders, gravels and cobbles.

A2 0 to 3 inches -Pale brown (10YR 6/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse platy structure; soft, friable, slightly sticky, slightly plastic; very few fine and very fine roots; many fine and medium tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (1 to 5 inches thick.)

B1 3 to 8 inches -Reddish brown (5YR 5/3) gravelly loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; very few fine and medium roots; common fine and medium tubular pores; common thin clay films on peds and in pores; slightly effervescent; moderately alkaline (pH 8.0).

R 8 inches+-Basalt bedrock

Type Location: About one mile west of Area 17 headquarters on high terrace.

Range in Characteristics: Average annual temperature immediately above bedrock is less than 59°F and greater than 47°F. The soil is usually dry more than 60 consecutive days during most years, mainly during the late summer and early fall months. Textures of the control section include loam and clay loam modified by gravel. Coarse fragments range from 25 to 50 percent. Stones and cobbles range up to 25 percent and gravel may range from 30 to 40 percent. The pH of the soil profile may range from 8.0 to 8.2. Mineralogy is mixed. Depth to extremely hard bedrock ranges from 6 to 10 inches. Color of the soil profile, except for bedrock, includes hues of 10YR and 5YR, values of 5 or 6 dry, 4 moist, and chromas of 3. Clay films in the B horizons may range from common thin to many moderately thick films.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Echo soils occur on gently to moderately sloping high terraces with slope gradients between 2 and 8 percent. They have developed in residuum from basalt, tuff, and limestone at elevations between 4,800 and 5,200 feet. The average annual precipitation ranges from 6 to 8 inches. The climate is semi-arid with a mean annual air temperature of about 52°F, the average January temperature is 38°F and the July temperature is 71°F; the frost-free season is from 130 to 150 days.

Principal Associated Soils: Common associates of the Echo soils, are Pahute, Timpahute, Eleana, and Big Butte. The Pahute soils differ by having a silica-lime hardpan. Timpahute soils differ by having strongly cemented indurated silica-lime hardpans. Eleana soils differ by having a gravelly silica-lime cemented pan. Big Butte soils differ by having a darker colored profile and are deeper to bedrock.

Drainage and Permeability: Well drained. Runoff is medium to rapid depending on slope and vegetative cover. Permeability is moderate to bedrock and very slow to impermeable through the bedrock.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation has a plant density of approximately 10 percent and consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), juniper (*Juniperus osteosperma*), Nevada joint-fir (*Ephedra nevadensis*), pinyon pine

(*Pinus monophylla*), Spanish bayonet (*Yucca baccata*), and traces of cliff rose (*Cowania mexicana* var. *stansburiana*), squirrel tail (*Sitanion hystrix*), Nevada bluegrass (*Poa nevadensis*), Indian ricegrass (*Oryzopsis hymenoides*), and buckwheat (*Eriogonum maculatum*).

Distribution and Extent: These soils are of limited extent in Area 18, but may occur in other adjacent areas in south central Nevada.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Echo is the name of a canyon just over the California line from the Nevada Test Site.

ELEANA SERIES

Survey Hole No. 34

The Eleana series is a member of loamy skeletal, mixed, mesic family of Typic Haploxerolls. The Eleana soils have brown A1 horizons containing about 1 percent organic matter content, Si-Cca horizons within 20 inches of the soil surface, parent materials containing more than 30 percent silica and are mildly alkaline throughout, with the exception of the A1 horizon.

Typifying Pedon: Eleana very stony and gravelly sandy loam (virgin) (Colors for dry conditions unless otherwise noted.) The soil surface is covered with big boulders, gravel, and cobbles.

A1 0 to 4 inches-Brown (10YR 5/3) very stony and gravelly sandy loam, very dark grayish brown (10YR 3/2)moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine and very fine roots; many fine and medium tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (1 to 6 inches thick.)

B2 4 to 8 inches-Reddish brown (5YR 5/3) sandy clay loam, dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; plentiful fine and medium roots; common fine and medium tubular pores; common thin clay films on peds and in pores; slightly effervescent; mildly alkaline (pH 7.6); clear smooth boundary. (3 to 6 inches thick.)

B3 8 to 13 inches-Reddish brown (5YR 5/3) gravelly sandy loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; plentiful fine and medium roots; few fine and medium tubular and interstitial pores; strongly effervescent, mildly alkaline (pH 7.6); clear wavy boundary. (3 to 6 inches thick.)

Clsicam 13 to 48 in+-Very pale brown (10YR 7/3) silica-lime cemented gravel, very pale brown (10YR 7/3) moist; massive, firm when dry and moist, nonstickly, nonplastic; very few fine and medium roots; strongly to violently effervescent; mildly alkaline (pH 7.6).

Type Location: The site is approximately 300 feet southwest of the big water tower on a hill west of the Panute Control Point. The profile was described from the road cut on the dugway in Area 18.

Range in Characteristics: Average annual temperature immediately above the silica-lime cemented gravel ranges from 47° F to 59° F. The soil is usually dry for six months or more during most years, mainly during the spring and the fall months. Mineralogy is mixed. Depth to the silica-lime cemented gravel ranges from 8 to 18 inches. Color of the soil includes hues of 10YR and 5YR, values of 5 to 7 dry 3, 4, and 7 moist, and chromas of 2 or 3. The organic matter content of the upper 4 inches, after mixing, will be about 1 percent. Textures of the control section include stony sandy loam, sandy clay loam, and clay loam modified by gravel. Reaction of the soil profile ranges from 7.6 to 8.0.

Competing Series and Their Differentiae: The Holbrook soils have been classified in the same family.

Setting: Eleana soils occur on steeply sloping (15 to 45 percent slope gradient) side slopes of strongly dissected old terraces. They have developed in shallow gravelly and stony alluvium derived from basalt, tuff, and limestone. The soils are at elevations ranging from 4,800 to 5,200 feet in a semi-arid climate with warm summers and cool winters. The mean annual precipitation is between 8 to 12 inches, and the mean annual air temperature is between 50°F and 60°F. The average monthly temperature ranges from 35°F to 38°F in January, and 69°F to 72°F in July; the frost-free season ranges from 120 to 150 days.

Principal Associated Soils: Common associates of the Eleana series are Buckboard, Beatty, and Rainier soils. Buckboard soils differ by having a vesicular coarse platy A2 horizon. Beatty soils occur in dry washes and differ by having very gravelly sandy control sections. Rainier soils occur on old terraces and alluvial fans and differ by having prismatic structure and indurated silica-lime hardpans.

Drainage and Permeability: Well drained. Surface runoff is rapid because of the steep slopes. Permeability is moderate to the cemented silica-lime hard pan and very slow through the fan.

Use and Vegetation: The vegetation consists primarily of big sage (*Artemesia tridentata*), juniper (*Juniperus osteosperma*), black sage (*Artemisia arbuscula* subsp. *nova*), pinyon pine (*Pinus monophylla*), Nevada bluegrass (*Poa nevadensis*), Nevada joint-fir (*Ephedra nevadensis*), gallata grass (*Hilaria jamesii*), cliff rose (*Cowania mexicana* var. *stansburiana*), Indian ricegrass (*Oryzopsis hymenoides*), Russian thistle (*Salsola kali*), small rabbitbrush (*Chrysothamnus viscidiflorus*), desert needlegrass (*Stipa speciosa*), and brome grass (*Bromus tectorum*). Available forage is used to provide very limited livestock grazing because of the stoniness and steepness of the hills.

Distribution and Extent: These soils are known to occur in Area 18, but may occur in other valleys in central Nevada. They are of low extent.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Eleana is the name of a mountain range near the Nevada Test Site.

HALFPINT SERIES

Survey Hole No. 16

The Halfpint series is a member of sandy skeletal, mixed, nonacid, mesic family of Typic Torripsamments. Typically the Halfpint soils have thin, very pale brown A1 horizons and have gravelly loamy sandy control sections with a few cobbles below 40 inches.

Typifying Pedon: Halfpint gravelly loamy sand (virgin)
(Color for dry conditions unless otherwise noted.)

A1 0 to 5 inches- Very pale brown (10YR 7/3) gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure breaking to single grain, soft, friable, nonsticky, nonplastic; few fine and very fine roots; common fine tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (1 to 8 inches thick.)

C1 5 to 48 inches+-Very pale brown (10YR 7/3) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure breaking to single grain, soft, friable, nonsticky, nonplastic; few fine and medium roots; common fine tubular and interstitial pores; strongly effervescent; moderately alkaline (pH 8.2).

Type Location: The site is approximately 1 mile northeast of the airport in Area 18 and is 400 feet south of Buckboard Mesa Highway in Area 18.

Range in Characteristics: The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues 10YR values of 6 or 7 dry and 3 to 5 moist, and chromas of 2 to 4.

Occasionally the A1 horizon may be at least one-half unit of value darker, either moist or dry, than the remainder of the profile. Texture of the control section is predominantly gravelly loamy sand, with a few cobbles at a depth below 40 inches. The coarse fragments range from 50 to 80 percent, with gravel predominating. Gravel ranges from 50 to 75 percent, and cobbles up to 20 percent. Lime or silica may be present and the content is variable from one strata to another but is always at least effervescent. Occasional thin lime or silica coatings may occur on some gravel undersides in the C1 horizons. The pH values of the profile range from 7.4 to 8.2.

Competing Series and Their Differentiae: There are two other series, Bluewing an established series and Inmo a tentative series in the same family at the present time. The Bluewing series differs by having a Cca horizon. Inmo series differs by being derived primarily from granite and gneiss; it contains more than 1 percent fine muscovite and biolite mica, and the lime is dissimulated throughout the control section. Other similar soils include Carrizo, Arizo, Cajon, and Brazito. Carrizo soils differ only in having mean annual soil temperatures greater than 71.6°F. Cajon soils are sandy throughout, lacking the gravel content that is common throughout the Halfpint soils. Arizo soils differ by having mean annual soil temperatures greater than 71°F. Brazito soils have fine sand or sand control sections.

Setting: Halfpint soils occur at elevations of about 4,800 to 5,200 feet on nearly level to gently sloping floodplains and recent alluvial fans. Slope gradients are dominantly between 2 to 4 percent but range upward to 8 percent. These soils developed in gravelly sandy alluvium derived from mixed rock sources including tuff, basalt, rhyolite, limestone, and older valley-fill material. The climate is semi-arid with mean annual precipitation of 6 to 8 inches. The mean annual air temperature is about 52°F, the January mean temperature is 38°F and July is about 71°F; the frost-free season is 130 to 150 days.

Principal Associated Soils: Common associates of the Halfpint series are Buckboard, Beatty, Bluewing, and Rainier soils. The Buckboard soils differ by being shallow over hardpan. Beatty soils differ by having a sandy control section. Bluewing soils differ by having a Cca horizon. Rainier soils differ by having a fine textured control section.

Drainage and Permeability: Well to somewhat excessively drained. Surface runoff is very slow. Soil permeability is very rapid.

Use and Vegetation: These soils are used for grazing but provides only fair grazing. The vegetation consists of four-winged saltbush (*Atriplex canescens*), brome grass (*Bromus tectorum*), buckwheat (*Eriogonum maculatum*), big sage (*Artemisia tridentata*), Nevada joint-fir (*Ephedra nevadensis*), Indian ricegrass (*Oryzopsis hymenoides*), squirrel tail (*Sitanion hystrix*), and green fire (*Menodora spinescens*). Plant density ranges from approximately 10 to 15 percent.

Distribution and Extent: The soils are known to occur in Area 18, but may occur in other valleys of central Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Halfpint is the name of a mountain range near the Nevada Test Site.

HAMPEL SERIES

Survey Hole No. 44

The Hampel series is a member of a loamy skeletal, mixed, mesic family of Lithic Mollic Camborthids. The Hampel soils typically have thin, light brownish gray A1 horizons containing less than 1 percent organic matter content, weakly expressed light reddish brown cambic horizons., control sections containing over 50 percent coarse fragments, and are shallow over tuff.

Typifying Pedon: Hampel stony sandy loam (virgin)
(Colors for dry conditions unless otherwise noted.)

A2 0 to 5 inches -Light brownish gray (10YR 6/2) cobbly and stony sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure, soft, friable, nonsticky, nonplastic; very few fine and very fine roots; many fine and medium tubular pores; strongly effervescent; moderately alkaline (pH 8.2) clear wavy boundary. (1 to 6 inches thick.)

B1 5 to 9 inches -Light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 5/4) moist; strong coarse subangular blocky structure; hard, friable, sticky, plastic; few fine and medium roots; common fine and medium tubular pores; slightly effervescent; mildly alkaline (pH 7.8)

R 9 inches+-Very pale brown (10YR 7/3) tuff bedrock, yellowish brown (10YR 5/4) moist; massive, very firm, nonsticky, nonplastic; very few fine and very fine roots; strongly effervescent; moderately alkaline (pH 8.0).

Type Location: The site is approximately ½ mile north of Area 17 headquarters and 300 feet east of power substation on the hillside in Area 18.

Range in Characteristics: Average annual temperature immediately above the bedrock ranges from 59°F to 71°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Depth to bedrock ranges from 8 to 20 inches. Color of the soil includes hues of 10YR and 5YR, values of 6 or 7 dry and 4 or 5 moist, and chromas of 2 or 4. The organic matter content of the upper 5 inches, after mixing, will not exceed 1 percent. Texture of the control section includes very gravelly loam gravelly clay loam modified by cobbles or stones. Coarse fragments range from 50 to 75 percent. Gravel ranges from 25 to 45 percent, cobbles range up to 15 percent and stones may range up to 25 percent. Reaction of the soil profile ranges from 7.8 to 8.2. Occasional to common soft lime segregations and/or thin lime coatings on undersides of coarse fragments may occur in the lower 5 inches of the soil, immediately above the bedrock, or are present as coatings on the bedrock surface and in crevices.

Competing Series and Their Differentiae: Hampel soils have been classified in the same family as Pulsipher series. Pulsipher soils differ by containing less than 18 percent clay in the control section.

Setting: Hampel soils are on moderately steep foothill or lower mountain slopes where the gradients commonly range from 15 to 31 percent. They have developed in residuum from sedimentary rock sources including tuff or basalt at elevations of 4,800 to 5,100 feet. The climate is semi-arid, having a mean annual precipitation ranging from 6 to 12 inches and mean annual temperature of about 52°F. The average January temperature is about 38°F, July is 71°F, and the average frost-free season is about 130 to 150 days.

Principal Associated Soils: Common associates of the Hampel series are Tippipah, Timpahute, and Beatty soils. Tippipah soils differ by being weakly cemented by silica and having light brown columnar B2t horizons containing over 15 percent exchangeable sodium. Timpahute soils differ by having strongly cemented Si-ca indurated horizons. Beatty soils differ by being very deep with a coarse textured control section.

Drainage and Permeability: Well drained. Surface runoff is rapid because of the slope. Permeability is moderate through the A and B horizons and very slow through the tuff bedrock.

Use and Vegetation: Used for providing low producing livestock grazing. The vegetation has a plant density of approximately 10 percent and consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), pinyon pine (*Pinus monophylla*), juniper (*Juniperus osteosperma*), desert needlegrass (*Stipa speciosa*), Nevada joint-fir (*Ephedra nevadensis*), Spanish bayonet (*Yucca baccata*) squirrel tail (*Sitanion hystrix*), globe mallow (*Sphaeralcea grossulariaefolia*), four-winged saltbush (*Atriplex canescens*), small rabbitbrush (*Chrysothamnus viscidiflorus*), and cliff rose (*Cowania mexicana* var. *stansburiana*).

Distribution and Extent: These soils are of limited extent in Area 18, but may occur in other adjacent areas in central Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Hampel is the name of a hill near the Nevada Test Site.

INDIAN SPRINGS SERIES

Survey Hole No. 30

The Indian Springs series is a member of clayey skeletal, mixed, mesic family of Duric Haplargids. Typically Indian Springs soils are very pale brown or light gray, calcareous and have a gravelly and cobbly clayey control section.

Typifying Pedon: Indian Springs gravelly clay (virgin)
(Colors for dry conditions unless otherwise noted.)

A2 0 to 4 inches-Very pale brown (10YR 7/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse platy structure; soft, friable, slightly sticky, slightly plastic; very few fine and very fine roots; many medium and fine tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (1 to 6 inches thick.)

B1 4 to 12 inches-Reddish brown (5YR 5/4) gravelly clay, reddish brown (5YR 4/3) moist; strong coarse subangular blocky structure; hard friable, very sticky, very plastic; very few fine and very fine roots; many medium and fine tubular pores; many thin clay films on peds and in pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (5 to 10 inches thick.)

B2 12 to 36 inches-Light reddish brown (5YR 6/4) cobbly loam, with silica-lime white (10YR 8/1) streaks, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable very sticky, very plastic; very few fine and very fine roots; common fine and medium pores; common thin clay films in peds and in pores; slightly effervescent; moderately alkaline (pH 8.0); clear wavy boundary. (10 to 24 inches thick.)

B3 36 to 43 in+-Light reddish brown (5YR 6/4) gravelly sandy loam, with silica-lime white (10YR 8/1) streaks, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, sticky, plastic; very few fine and very fine roots; few fine and medium tubular pores; common thin clay films on peds and in pores; violently effervescent; strongly alkaline (pH 8.8). Silica-lime coatings on the outsides of the cobbles.

Type Location: The site is approximately 3 miles west of the Well 8 road and the airport highway junction in the wash where the range cattle watering trough used to be located. It is approximately 300 feet north of the Buckboard Mesa road.

Range in Characteristics: Average annual soil temperature at a depth of 20 inches is less than 59°F, and greater than 47°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues 10YR and 5YR, values of 5 to 8 dry and 4 moist, and chromas of 2 to 4. Texture of the control section is predominantly clay, (with clay content of 35 percent or over) loamy and clay loam modified with gravel and cobbles. The coarse fragments range from 35 to 50 percent, with gravel predominating. Gravel ranges from 25 to 35 percent, cobbles up to 15 percent and stones up to 15 percent. Silica-lime coated the outsides of the cobbles and stones. This soil may have weakly cemented silica-lime hardpan. The lime content, however, does not exceed 5 percent or never contains 2 percent more lime than the next underlying horizons. The pH values of the profile range from 8.0 to 8.8.

Competing Series and Their Differentiae: There are no other series in the same family at the present time.

Setting: Indian Springs soils occur at elevations of about 4,800 to 5,200 feet on gently to moderately sloping alluvial fans. Slope gradients that are dominantly between 2 to 4 percent but range upward to 8 percent. These soils have developed in gravelly, cobbly and stony alluvium derived from mixed rock sources including basalt, tuff and limestone. The climate is semi-arid having a mean annual precipitation of 6 to 8 inches. The mean annual air temperature ranges from 51°F to 57°F, the average January temperature is about 38°F; the July temperature is about 71°F; and the frost-free season is about 130 to 150 days.

Principal Associated Soils: Common associates of Indian Springs soils are Buckboard, Timpahute and Oak Spring soils. The Buckboard soils differ by a silica-lime cemented hardpan. Timpahute soils differ by having strongly cemented silica-lime indurated horizons. Oak Spring soils differ by having a buried B horizon and is in the coarse loamy family.

Drainage and Permeability: Well drained. Surface runoff is moderately rapid to rapid. Soil permeability is slow to moderate.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation consists of wolfberry (*Lycium andersonii*), black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), Nevada joint-fir (*Ephedra nevadensis*), horsebrush little-leaf (*Tetradymia glabrata*), desert needlegrass (*Stipa speciosa*), squirrel tail (*Sitanion hystrix*), winter fat (*Eurotia lanata*), bud sage (*Artemisia spinescens*), four-winged saltbush (*Atriplex canescens*), globe mallow (*Sphaeralcea grossulariaefolia*), spiny hop-sage (*Grayia spinosa*), and loco weed (*Astragalus lentiginosus*), Total plant density is about 15 percent.

Distribution and Extent: Indian Springs soils are known to occur in Area 18 and may be found in other areas in south central Nevada. These soils are not extensive in the soil survey of Area 18.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Indian Springs is the name of a small town 18 miles east of the Nevada Test Site.

KEANE SPRING SERIES
Survey Hole No. 24

The Keane Spring series is a member of a sandy, mixed, mesic family of Fluventic Haploxerolls. The Keane Spring soils typically have dark grayish brown A1 horizons containing about 1.5 percent organic matter, loamy sand control sections, and are calcareous throughout.

Typifying Pedon: Keane Spring loamy sand (virgin)
(Color for dry conditions unless otherwise noted.)

A11 0 to 5 inches-Dark grayish brown (10YR 4/2) loamy sand, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine and very fine roots; common fine interstitial pores; slightly effervescent, moderately alkaline (pH 8.2); clear smooth boundary. (2 to 8 inches thick.)

A12 5 to 12 inches-Dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; very weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine and medium roots; common fine interstitial pores; slightly effervescent, moderately alkaline (pH 8.4); clear wavy boundary. (5 to 12 inches thick.)

C1 12 to 40 inches-Dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; massive; soft, friable, nonsticky, nonplastic; very few fine and medium roots; common fine interstitial pores; strongly effervescent, strongly alkaline (pH 8.6); clear wavy boundary. (10 to 30 inches thick.)

C2 40 inches+-White (10YR 8/2) cobbly gravelly sand, gray (10YR 5/1) moist; single grain; loose when dry and moist, nonsticky, nonplastic; very few fine and medium pores;

violently effervescent; strongly alkaline (pH 9.0). Cobbles are covered with silica-lime on all sides.

Type Location: This site is in Area 18 and is approximately ½ mile northwest of Area 17 headquarters in a wash.

Range in Characteristics: Average annual temperature at a depth of 20 inches is less than 59°F and greater than 47°F. This soil is usually dry for more than 60 consecutive days during most years, mainly during the late summer and early fall months. Mineralogy is mixed. Color of the A11 horizons includes hues of 10YR, values of 4 and 8 dry, 2, 3, and 5 moist, and chromas of 1 or 3. Organic matter content of A11, A12, and C1 horizons may range from 1 to 3 percent. The pH values of the soil profile ranges from 8.2 to 9.0 and is usually highest in the C2 horizon. The C2 horizon is high in sodium, but may range from low to high in sodium. Texture of the control section includes loamy sand, gravelly loamy sand modified by cobbles. Coarse fragments range from 30 to 50 percent. Stones and cobbles range up to 15 percent and gravel may range from 20 to 35 percent in the C1 and C2 horizons.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Keane Spring soils occur on smooth alluvial fans and floodplains with slope gradients between 2 and 4 percent. These soils have developed from mixed alluvium derived mainly from basalt with some admixture from tuff, limestone and other sedimentary rocks at elevations between 4,800 and 5,200 feet. The climate is semi-arid, having a mean annual precipitation of 6 to 8 inches. The mean annual air temperature ranges from 51°F to 57°F, the average January temperature is about 38°F, and the July temperature is about 71°F; the frost-free season ranges from about 130 to 150 days.

Principal Associated Soils: Common associates of Keane Spring soils are Pahute, Bare and Hampel series. The Pahute soils differ by being shallow over silica-lime hardpan. Bare soils differ by having very gravelly coarse textured control sections. Hampel soils differ by being shallow over tuff bedrock.

Drainage and Permeability: Well drained. Runoff is slow to very slow. Permeability is rapid to moderately rapid.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation consists of big sage (*Artemisia tridentata*), scrub oak (*Quercus turbinella*), cliff rose (*Cowania mexicana* var. *stansburiana*), big rabbitbrush (*Chrysothamnus teretifolius*), annual buckwheat (*Eriogonum maculatum*), perennial buckwheat (*Eriogonum ovalifolium*), Nevada joint-fir (*Ephedra nevadensis*), small rabbitbrush (*Chrysothamnus viscidiflorus*), juniper (*Juniperus osteosperma*), and pinyon pine (*Pinus monophylla*). Plant density is about 25 percent.

Distribution and Extent: Mapped in Area 18 and may occur in other valleys of central and southern Nevada.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Keane Spring is the name of a spring west of the Nevada Test Site, just inside of the California state line.

OAK SPRING SERIES

Survey Hole No. 28

The Oak Spring series is a member of a coarse-loamy, mixed mesic family of Mollic Camborthids. Typically Oak Spring soils are light brownish gray or light gray, calcareous and have gravelly and cobbly sandy control sections.

Typifying Pedon: Oak Spring fine sandy loam (virgin)
(Colors for dry conditions unless otherwise noted.)

A1 0 to 4 inches-Light brownish gray (10YR 6/2) fine sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; plentiful fine and very fine roots; few fine tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.4); clear smooth boundary. (2 to 6 inches thick.)

A2 0 to 8 inches-Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; abundant fine and medium roots; few fine tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (3 to 8 inches thick.)

C1 8 to 15 inches-Very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; strong coarse subangular blocky structure; hard, friable, nonsticky, nonplastic; abundant fine and medium roots; few fine tubular and interstitial pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary. (5 to 12 inches thick.)

C2 15 to 44 inches-Very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; massive; loose when dry and moist; nonsticky, nonplastic; very few fine interstitial pores; violently effervescent; strongly alkaline (pH 8.8); clear smooth boundary. (18 to 36 inches thick.)

B1b 44 to 60 inches-Light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/3) moist; strong coarse subangular blocky structure; hard, friable, nonsticky, nonplastic; very few fine and very fine roots; few fine tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.2).

Type Location: The site is approximately one-half mile east and 600 feet south of the road going to the range cattle watering trough, in a wash southwest of pit 27. It is about 2 miles west and 600 feet south from the junction of Well 8 road and the highway going to the airport.

Range in Characteristics: Average annual soil temperature at a depth of 20 inches is less than 59°F and greater than 47°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues 10YR and 5YR, values of 6 or 7 dry, 3 or 4 moist, and chromas of 2 to 4. Occasionally, the A1 horizon may be at least one-half unit of value darker, either moist or dry, than the remainder of the profile. Texture of the control section is predominantly loamy sand,coarse sandy loam or fine sandy loam modified by gravel and cobbles. The coarse fragments range from 30 to 50 percent with gravel predominating. Gravel ranges from 20 to 35 percent, cobbles up to 15 percent and stones up to 5 percent. The pH values of the profile ranges from 8.2 to 8.8.

Competing Series and Their Differentiae: There are two series, Haybourne and Rebel, that have been described in the same family in the state of Nevada, but they cannot be compared because the writer has not seen the series descriptions to compare them with the Oak Spring series, Setting: Oak Spring soils occur at elevations of about 4,800 to 5,200 feet on nearly level to gently sloping floodplains and recent alluvial fans. Slope gradients are dominantly between 2 to 4 percent but range upward to 8 percent. These soils have developed in gravelly and cobbly sandy alluvium derived from mixed rock sources including basalt, tuff, and limestone. The climate is semi-arid having a mean annual precipitation of 6 to 8 inches. The mean annual air temperature ranges from 51°F to 57°F, the average January temperature is about 38°F; the July temperature is about 71°F, and the frost-free season ranges from about 130 to 150 days.

Principal Associated Soils: Common Associates of Oak Spring Soils are Buckboard, Timpahute and Rainier soils. The Buckboard soils differ by having a silica-lime cemented hardpan. Timpahute soils differ by having strongly cemented silica-lime indurated horizons. Rainier soils differ by having duripans.

Drainage and Permeability: Well drained. Surface runoff is very slow to slow. Soil permeability is moderate to moderately rapid.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation consists of wolfberry (*Lycium andersonii*), big sage (*Artemisia tridentata*), horsebrush little-leaf (*Tetradymia glabrata*), four-winged saltbush (*Atriplex canescens*), desert needlegrass (*Stipa speciosa*), Indian ricegrass (*Oryzopsis hymenoides*), Nevada joint-fir (*Ephedra nevadensis*), squirrel tail (*Sitanion hystrix*), globe mallow(*Sphaeralcea grossulariaefolia*), and cacti (*Opuntia basilaris*). Total plant density is about 20 percent.

Distribution and Extent: Oak Spring soils are known to occur in Area 18 of the Nevada Test Site and may be found in other areas in south central Nevada. These soils are not extensive in the soil survey of Area 18.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Oak Spring is the name of a spring on the Nevada Test Site.

PAHUTE SERIES

Survey Hole No. 43

The Pahute series is a member of a loamy-skeletal, mixed, mesic, shallow family of Typic Durorthids. The Pahute soils typically have light gray A1 horizons and are shallow to very shallow over indurated silica-lime hardpans.

Typifying Pedon: Pahute gravelly sandy clay loam (virgin)
(Colors for dry conditions unless otherwise noted.)

A2 0 to 4 inches-Light gray (10YR 7/1) gravelly and cobbly sandy loam, dark gray (10YR 4/1) moist; moderate medium platy structure; soft, friable, nonsticky, nonplastic; plentiful fine and medium roots; many fine and medium vesicular and tubular pores; slightly effervescent, moderately alkaline (pH 8.2) clear smooth boundary. (1 to 6 inches thick.)

B1 4 to 12 inches-Light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable; slightly sticky, slightly plastic; plentiful fine and medium roots; common fine and medium tubular pores; slightly effervescent; moderately alkaline (pH 7.8).

Clsicam 12 inches+-White (10YR 8/1) silica-lime, cemented gravel-tuff, very pale brown (10YR 7/3) moist; massive; very firm dry and moist; nonsticky, nonplastic; violently effervescent; moderately alkaline (pH 8.0).

Type Location: This site is located in Area 18 and is about ½ mile north of Area 17 headquarters and 300 feet northeast of power substation on top of the hill.

Range in Characteristics: Average annual soil temperature at a depth of 12 inches or immediately above the silica-lime hardpan is less than 59°F and more than 47°F. Depth to the silica-lime hardpan is 10 to 12 inches. The erosion pavement may be or may not be present. Where the erosion pavement occurs, at least 65 percent of the soil surface is covered with coarse fragments. These are predominantly gravel in size, but some cobbles or stones are not uncommon. The soil is usually dry for 6 months or more during most years, mainly during the spring and fall months. The mineralogy is mixed. Organic matter content of the A1 horizon is less than 1 percent. Color of the soil profile, except for the C1sicam horizons, includes hues of 10YR and 5YR values of 6 or 7 dry and 4 moist, and chromas of 1, 2, or 4. The color of the Csicam horizons includes hues of 10YR values of 8 dry and 7 moist, and chromas of 1. Textures of the control section include loam and sandy clay loam modified by gravel and cobbles. The pH will range from 7.8 to 8.4.

Competing Series and Their Differentiae: There is one other series, Pahroc, which is an established series in the same family. The Pahroc series differs by being derived primarily from ignimbrites, dolomite, limestone, quartzite, sandstone, and shale.

Setting: Pahute soils occur at elevations ranging from 4,800 to 5,200 feet on gently sloping low terraces and convex hilltops. Slope gradients are dominantly between 2 and 4 percent but may range up to 8 percent. These soils developed in gravelly and cobbly alluvium derived from mixed rock sources including basalt, tuff and limestone. The climate is semi-arid with mean annual precipitation of 6 to 8 inches. Mean annual air temperature is about 52°F, in January it is about 38°F and in July about 71°F. The frost-free season is 130 to 150 days.

Principal Associated Soils: Common associates of the Pahute series are Bullfrog, Bare, and Hampel soils. The Bullfrog soils differ by having a darker colored A1 horizon and have a deeper control section. Bare soils differ by not having B1 horizons and are not limited by a silica-lime hardpan. Hampel soils differ by developing over tuff bedrock.

Drainage and Permeability: Well to moderately well drained. Surface runoff is rapid. Permeability is moderate to the hardpan and very slow through the pan.

Use and Vegetation: Used for providing low producing livestock grazing. The vegetation has a plant density of approximately 10 percent and consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), desert needlegrass (*Stipa speciosa*) juniper (*Juniperus osteosperma*), pinyon pine (*Pinus monophylla*), and traces of four-winged saltbush (*Atriplex canescens*), squirrel tail (*Sitanion hystrix*), Nevada joint-fir (*Ephedra nevadensis*), wolfberry (*Lycium andersonii*), small rabbitbrush (*Chrysothamnus viscidiflorus*), globe mallow (*Sphaeralcea grossulariaefolia*), Spanish bayonet (*Yucca baccata*), and cliff rose (*Cowania mexicana* var. *stansburiana*).

Distribution and Extent: These soils are of limited extent in Area 18, but may occur in other adjacent areas in south central Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Pahute is a name of a mesa inside of the test site.

RUDDLE SERIES
Survey Hole No. 54

The Ruddle series is a member of a sandy skeletal, mixed, mesic family of Duric Mollic Camborthids. Typically Ruddle soils are light brownish gray or pale brown, calcareous and have gravelly and cobbly sandy control section.

Typifying Pedon: Ruddle gravelly fine sand (virgin)
(Colors for dry conditions unless otherwise noted.)

A1 0 to 4 inches-Light brownish gray (10YR 6/2) gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; very few fine and very fine roots; many fine and medium interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary. (1 to 6 inches thick.)

C1 4 to 12 inches-Light brownish gray (10YR 6/2) cobbly and gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; very few fine and medium roots; common fine and medium interstitial pores; violently effervescent, moderately alkaline (pH 8.2); clear wavy boundary. (4 to 10 inches thick.) Thin lime coatings on all sides of the cobbles and gravel.

C2 12 to 50 in +-Light gray (10YR 7/1) cobbly gravelly sand, dark grayish brown (10YR 4/2) moist; single grain loose dry and moist, nonsticky, nonplastic; few fine and medium interstitial pores; violently effervescent, moderately alkaline (pH 8.0).

Type Location: The site is approximately ½ mile south of the Area 18 airport in a wash opposite area sign 18B-RD.

Range in Characteristics: The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Color of the soil profile includes hues of 10YR, and values of 6 or 7 dry and 3 to 5 moist, and chromas of 2 to 4. Occasionally the A1 horizon may be at least one-half unit of value darker, either moist or dry, than the remainder of the profile. Texture of the control section is predominantly cobbly gravelly sand, or sandy loam modified by gravel. The coarse fragments range from 50 to 95 percent, with gravel predominating. Gravel ranges from 50 to 75 percent, cobbles up to 25 percent and stones up to 5 percent. Lime content is variable from one strata to another but is always at least effervescent. Thin lime coatings may occur on some gravel and cobbles in the C horizons. The lime content, however, does not exceed 15 percent or never contains 5 percent more lime than the next underlying horizons. The pH values of the profile range from 7.4 to 8.4.

Competing Series and Their Differentiae: There are no other series in the same family at the present time.

Setting: Ruddle soils occur at elevations of about 4,800 to 5,100 feet on nearly level to moderately sloping floodplains and recent alluvial fans. Slope gradients are dominantly between 2 to 4 percent but range upward to 8 percent. These soils have developed in very gravelly sandy alluvium derived from mixed rock sources including tuff, basalt and limestone. The climate is semi-arid with annual precipitation of 6 to 8 inches. The mean annual air temperature is about 52°F, the January temperature is about 38°F, and the July temperature is about 71°F. The frost-free season is from 130 to 150 days.

Principal Associated Soils: Common associates of the Ruddle series are Buckboard, Beatty, and Bluewing soils. The Buckboard soils differ by having fine textured shallow profiles. Beatty soils differ by not having lime coated gravel and cobbles. Bluewing soils differ by having Cca horizons.

Drainage and Permeability: Well to excessively drained. Surface runoff is very slow. Permeability is rapid to moderate.

Use and Vegetation: These soils are used to provide low to fair producing livestock grazing. The vegetation is made up of varying percentages of Nevada joint-fir (*Ephedra nevadensis*), four-winged saltbush (*Atriplex canescens*) , Russian thistle (*Salsola kali*), annual buckwheat (*Eriogonum maculatum*), small rabbitbrush (*Chrysothamnus viscidiflorus*), Indian ricegrass (*Oryzopsis hymenoides*), cliff rose (*Cowania mexicana* var. *stansburiana*), squirrel tail (*Sitanion hystrix*), and greenfire (*Menodora spinescens*). The plant density ranges from 5 to 10 percent.

Distribution and Extent: Mapped in Area 18 and may be found in adjacent parts of Nevada.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Ruddle is the name of a mountain peak near the Nevada Test Site.

SAWTOOTH SERIES

Survey Hole No. 45

The Sawtooth series is a member of a fine-loamy, mixed, mesic family of Lithic Camborthids. The Sawtooth soils typically have light gray A1 horizons and a strong coarse platy structure. They are very shallow to bedrock.

Typifying Pedon: Sawtooth stony loam
(Color for dry condition unless otherwise noted.)
Surface covered with gravel and cobble pavement and some boulders.

A2 0 to 4 inches-Light gray (10YR 7/2) stony, loam, dark grayish brown (10YR 4/2) moist; strong coarse platy structure; soft, friable, slightly sticky, slightly plastic, very few fine and very fine roots; many fine and medium vesicular tubular pores; slightly effervescent; moderately alkaline (pH 8.2) clear smooth boundary. (2 to 6 inches thick.)

B2 4 to 8 inches-Light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly sticky, slightly plastic, very few fine and medium roots, common fine and medium tubular pores; slightly effervescent; moderately alkaline (pH 8.2).

R 8 inches+-Bedrock covered with silica and lime.

Type Location: The site is about ½ mile south of the junction of the highway going to Area 17 headquarters and one going to the airport. It is east of the powerline on top of the hill in Area 18.

Range in Characteristics: Average annual soil temperature immediately above the bedrock ranges from 47°F to 60°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. Depth to bedrock ranges from 8 to 15 inches. Color of the soil includes hues of 10YR and 5YR, values of 6 or 7 dry and 4 moist, and chromas of 2 or 4. The organic matter content of the upper four inches, after mixing, will not exceed one percent. Texture of the control section includes sandy clay loam, and loam modified by gravel. Reaction of the soil profile may range from 8.0 to 8.4.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time.

Setting: Sawtooth soils occur on hilltops and hillside slopes with gradients ranging from 2 to 4 percent on the tops and from 15 to 30 percent on the side slopes. These soils have developed from mixed alluvium derived mainly from basalt with some admixture from tuff and limestone. The climate is semi-arid, having a mean annual precipitation of 8 to 12 inches. The temperatures are warm in summer and cool in winter. The mean average temperature is about 52°F, the January temperature is about 38°F, the July temperature is about 71°F, and the frost-free season is from 130 to 150 days.

Principal Associated Soils: Common associates of Sawtooth soils are Buckboard, Beatty, and Bluewing. The Buckboard soils differ by being shallow over a silica-lime hardpan. Beatty soils differ by having a deep coarse textured profile. Bluewing soils differ by having a sandy skeletal control section.

Drainage and Permeability: Well drained to bedrock. Surface runoff is medium to rapid depending on the slope. Permeability is moderate.

Use and Vegetation: These soils are used for range but have a low carrying capacity. The vegetation consists of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), desert needlegrass (*Stipa speciosa*), Nevada joint-fir (*Ephedra nevadensis*), small rabbitbrush (*Chrysothamnus viscidiflorus*), Indian ricegrass (*Oryzopsis hymenoides*), Nevada bluegrass (*Poa nevandensis*), squirrel tail (*Sitanion hystrix*), four-winged saltbush (*Atriplex canescens*), and wolfberry (*Lycium andersonii*), The plant density is about 10 percent.

Distribution and Extent: Mapped in Area 18 and may occur in other valleys of central Nevada. It is not extensive.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Sawtooth is the name of a mountain range near the Nevada Test Site.

SCRANTON SERIES

Survey Hole No. 37

The Scranton series is a member of a loamy skeletal, mixed, mesic family of Duric Camborthids. Scranton soils typically have very pale brown A2 horizons, gravelly and cobbly clay loam control sections, are calcareous, and have weakly expressed brown B horizons and light yellowish brown C horizons.

Typifying Pedon: Scranton stony fine sandy loam (virgin)
(Colors for dry conditions unless otherwise noted.)
Surface covered with gravel and cobbles.

A2 0 to 5 inches-Very pale brown (10YR 7/3) stony fine sandy dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; very few fine and very fine roots; many medium and fine vesicular and tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (2 to 8 inches thick.)

B11 5 to 11 inches-Brown (10YR 5/3) loam, brown (10YR 4/3) moist; strong coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; common medium and fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); clear wavy boundary. (3 to 10 inches thick.)

B12 11 to 18 inches-Light yellowish brown (10YR 6/4) gravelly loam; dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; abundant fine and few medium roots; few medium and fine tubular pores; slightly effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (5 to 10 inches thick.)

C1si 18 to 32 in +-Light yellowish brown (10YR 6/4) very cobbly sandy clay loam with white (10YR 8/1) silica-lime streaks; dark yellowish brown (10YR 4/4) moist; massive, slightly hard, friable, nonsticky, nonplastic; abundant fine and very fine and few medium roots; very few fine tubular pores; violently effervescent; moderately alklaine (pH 8.4). Silica-lime all gravel and cobbles.

Type Location: About ½ mile west of Well 8 at the toe of the hillslope and about 100 feet north of the road in Area 18.

Range in Characteristics: Average annual temperature at a depth of 20 inches is less than 59°F and greater than 47°F. The soil is usually dry for more than 60 consecutive days during most years, mainly during the late summer and early fall months. Mineralogy is mixed. Color of the soil profile includes hues of 10YR, values of 5 to 8 dry and 4 moist, and chromas of 2 to 4. Textures of the control section are sandy clay loam, clay loam, and sandy loam modified with gravel and cobbles. The coarse fragments range from 50 to 75 percent, with gravel and cobbles predominating. Gravel ranges from 30 to 40 percent, cobbles up to 30 percent and stones up to 15 percent. Silica-lime coats the outsides of the cobbles and stones. This soil may have a weakly cemented silica-lime pan. The lime content, however, does not exceed 5 percent or never contains 2 percent more lime than the next underlying horizons. The pH values of the profile range from 8.0 to 8.4.

Competing Series and Their Differentiae: There are no other series in the same family at the present time.

Setting: Scranton soils occur at elevations of about 4,800 to 5,200 feet on steep to moderately sloping hillslopes. Slope gradients are dominantly between 4 to 8 percent but range upward to 30 percent. These soils have developed in gravelly, cobbly and stony alluvium derived from mixed rock sources including basalt, tuff, and limestone. The climate is semi-arid having a mean annual precipitation of 6 to 8 inches. The mean annual air temperature ranges from 51°F to 57°F, the average January temperature is about 38°F, the July temperature is about 71°F, and the frost-free season ranges from about 130 to 150 days.

Principal Associated Soils: Common associates of Scranton soils are Bare, Echo, and Eleana soils. The Bare soils differ by having a higher organic matter content. Echo soils differ by having a very shallow soil profile over bedrock. Eleana soils differ by having a higher organic matter content and have cemented gravel C horizons.

Drainage and Permeability: Well drained. Surface runoff is medium to rapid. Soil permeability is moderate.

Use and Vegetation: These soils are used for livestock grazing, wildlife food and cover, and watershed purposes. The vegetation consists of black sage (*Artemisia arbuscula* subsp. *nova*), galleta grass (*Hilaria jamesii*), desert needlegrass (*Stipa speciosa*), wolfberry (*Lycium andersonii*), Nevada joint-fir (*Ephedra nevadensis*), squirrel tail (*Sitanion hystrix*), small rabbitbrush (*Chrysothamnus viscidiflorus*), cacti (*Opuntia basilaris*), four-winged saltbush (*Atriplex canescens*), juniper (*Juniperus osteosperma*), cliff rose (*Cowania mexicana* var. *stansburiana*), and winter fat. Total plant density is about 15 percent.

Distribution and Extent: Scranton soils are known to occur in Area 18 and may be found in other areas in south central Nevada. These soils are not extensive in the Area 18 soil survey.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada 1967. Scranton is the name of a well just over the state line into California west of the Nevada Test Site.

TIMBER SERIES

Survey Hole No. 31

The Timber series is a member of fine loamy, mixed, mesic, shallow family of Entic Durorthids. The Timber soils typically have very pale brown A2 horizons, gravelly moderately fine textured control sections containing more than 20 percent clay and are calcareous throughout.

Typifying Pedon: Timber stony clay loam (virgin) (Colors for dry conditions unless otherwise noted.) The soil surface has strong desert pavement of gravel, cobbles, and stones.

A2 0 to 6 inches-Very pale brown (10YR 7/3) stony, clay loam, brown (10YR 4/3) moist; strong medium platy breaking to strong coarse subangular blocky structure; soft, friable, slightly sticky, slightly plastic; very few fine and medium roots; many fine and medium tubular pores; violently effervescent; moderately alkaline (pH 8.4) abrupt smooth boundary. (4 to 8 inches thick.)

B1 6 to 12 inches-Reddish brown (5YR 5/4) loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; very few fine and medium roots; few fine and medium tubular and interstitial pores, slightly effervescent; moderately alkaline (pH 8.2)

Clsicam 12 inches+ -White (10YR 8/1) silica-lime pan, very pale brown (10YR 7/3) moist; massive firm when dry and moist; nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.8).

Type Location: The site is in Area 18 of the Nevada Test Site and is approximately 400 feet southwest of the range cattle watering trough on a hilltop just above Buckboard Mesa road, Nye County, Nevada. (The watering trough is approximately 3 miles west of Area 18 airport road and Well 3 road.)

Range in Characteristics: Depth to the silica-lime hardpan ranges from 10 to 18 inches. The pH values of the soil profile range from 8.2 to 8.8 and are usually highest in the horizon immediately above the silica-lime hardpan. Average annual soil temperature at a depth immediately above the hardpan is less than 59°F and more than 47°F. The soil is usually dry for 6 months or more during most years, mainly during the spring and fall months. The mineralogy is mixed. Organic matter content of the A2 horizon is less than 1 percent. Color of the soil profile, except for the Clsicam horizons, includes hues of 10YR and 5YR, values of 5 or 7 dry and 3 moist, and chromas of 3. The color of the Clsicam horizons has hues of 10YR, values of 8 dry and 7 moist, and chromas of 1 and 3. Textures of the control section include clay loam and loam modified by gravel and cobbles. Clay content ranges from 20 to 30 percent.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time. Other similar soils include Blackhawk and Timper series. Blackhawk soils differ by having a silt loamy control section and a very deep soil profile. Timper soils differ by being classified in a loamy, mixed, mesic, shallow family. (Very similar except for texture.)

Setting: Timber soils occur on smooth hilltops or high-lying terraces with slope gradients from 8 to 30 percent. They have developed from mixed alluvium derived primarily from basalt, tuff and limestone at elevations of 4,800 to 5,000 feet. The climate is semi-arid, having a mean annual precipitation of 6 to 8 inches. The temperatures are warm, having a mean annual temperature of about 52°F; the January temperature is about 38°F, and the July temperature is about 71°F; the frost-free season is about 130 to 150 days.

Principal Associated Soils: Common associates of Timber soils are Buckboard, Rainier, Bluewing, and Halfpint series. Buckboard soils differ by being correlated in the Haplic Durorthids subgroup. The Rainier soils differ by having a strong coarse prismatic structure in the B2 horizons. Bluewing soils differ by having a sandy skeletal control section. Halfpint soils differ by having a very deep sandy control section.

Drainage and Permeability: Well drained. Surface runoff is medium to moderately rapid. Permeability moderate to the silica-lime hardpan and very slow through the pan.

Use and Vegetation: These soils are used for range having a low carrying capacity. The vegetation consists primarily of black sage (*Artemisia arbuscula* subsp. *nova*), small rabbitbrush (*Chrysothamnus viscidiflorus*), wolfberry (*Lycium andersonii*), Nevada joint-fir (*Ephedra nevadensis*), and traces of winter fat (*Eurotia lanata*) four-winged saltbush (*Atriplex canescens*), cacti (*Opuntia basilaris*), globe mallow (*Sphaeralcea grossulariaefolia*), squirrel tail (*Sitanion hystrix*), and brome grass (*Bromus tectorum*). The total plant density is approximately 15 percent.

Distribution and Extent: Mapped in Area 18 and may be found in other valleys of central and southern Nevada. Not extensive in this soil survey.

Series Proposed: Area 18 of the Nevada Test Site, Nye County, Nevada, 1967. Timber is the name of a mountain near the Nevada Test Site.

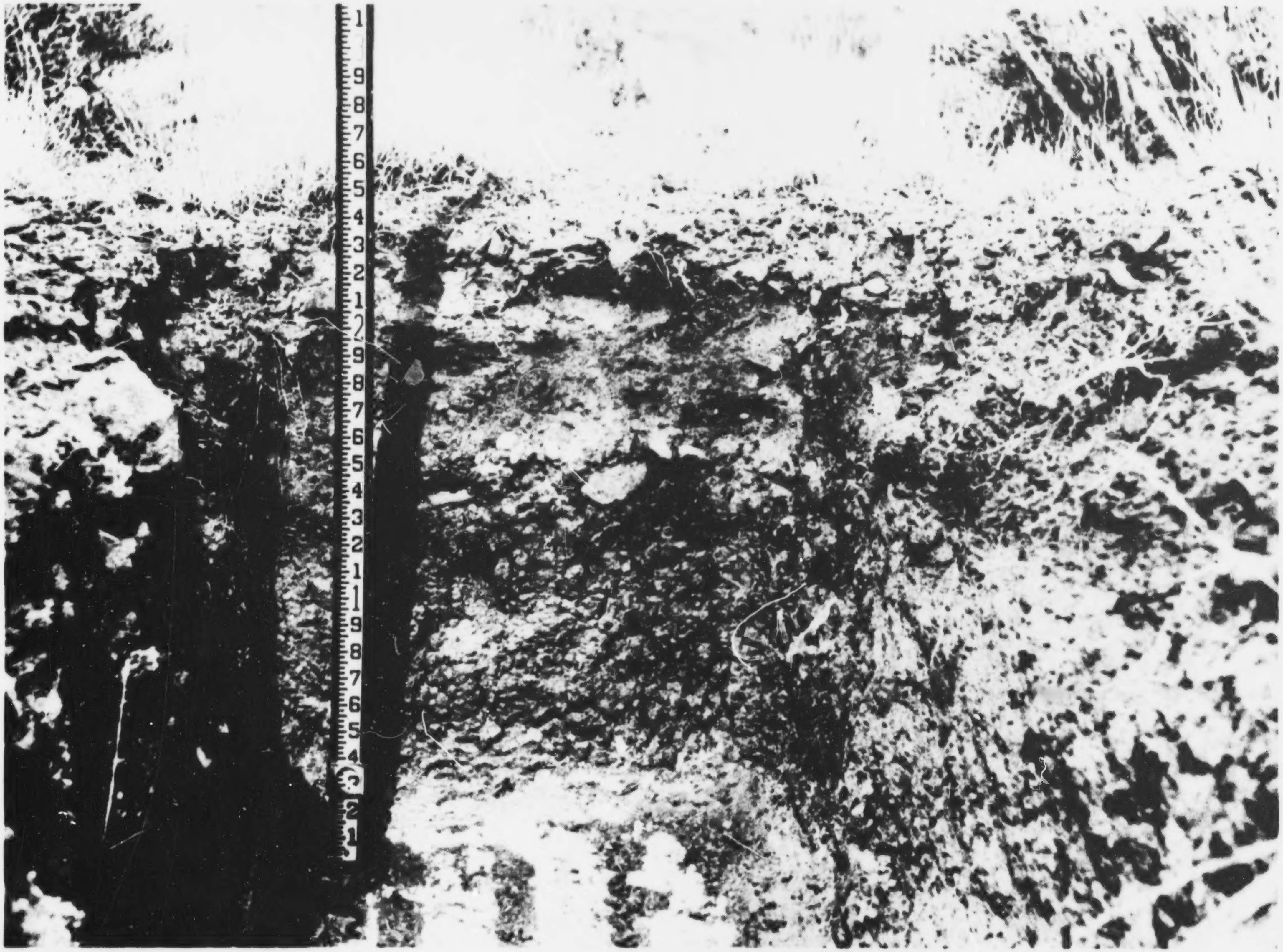

FIGURE 3. Typical profile of Timpahute series
(Hole #22; 3gF3R-Ti; TcC2; Mollic Durargids; bottom of hole is silica-lime pan.)

TIMPAHUTE SERIES

Survey Hole No. 5

The Timpahute series is a member of a fine, montmorillonitic, mesic family of Mollic Durargids. The Timpahute soils typically have light brownish gray A1 horizons and are shallow to moderately deep over strongly cemented indurated silica-lime hardpans.

Typifying Pedon: Timpahute gravelly loam (virgin)
This Timpahute profile was described on the NTS.
(Colors for dry conditions unless otherwise noted.)

A21 0 to 3 inches-Pale brown (10YR 6/3) gravelly loam, very dark grayish brown (10YR 3/2) when moist; the topmost ¼ to ½ inch consists of a pavement of sand and pebbles, with pebbles up to about 1 inch in diameter; beneath this the soil has weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; abundant fine and very fine roots; few fine and medium tubular pores; slightly effervescent; moderately alkaline (pH 8.4); clear smooth boundary. (1 to 4 inches thick.)

A22 3 to 8 inches-Brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) when moist; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; abundant fine and very fine roots; few fine and medium tubular pores; strongly effervescent, moderately alkaline (pH 8.0); clear smooth boundary. (3 to 6 inches thick.)

B2 8 to 20 inches-Reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) when moist; strong very coarse prismatic structure; slightly hard, friable, sticky, plastic; abundant

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fine, very fine, micro-roots and few medium roots; common fine and medium tubular pores; many thin clay films on peds and in pores; strongly effervescent, moderately alkaline (pH 8.2); clear wavy boundary. (8-18 inches thick.)

Clsica 20 inches +-Very pale brown (10YR 7/4) gravelly loam-silica-lime pan, yellowish brown (10YR 5/4) when moist; massive; slightly hard, friable, slightly sticky, slightly plastic, very few fine roots; very few fine tubular pores; violently effervescent; moderately alkaline (pH 8.0).

Type Location: One-fourth mile south of NW corner; section 6, T. 35 S., R. 18 W., about 3/4 mile southeast of Modena, Iron County, Utah. The Timpahute profile was located on a terrace ½ mile northeast of a watering trough for beef cattle (the trough located 1½ miles west of Well 8 road) in Area 18.

Range in Characteristics: Average annual temperature immediately above the hardpan ranges from 54°F to 69°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is montmorillonitic. Depth to silica-lime hardpan ranges from 8 to 30 inches. Color of the soil includes hues of 10YR, 7.5YR and 5 YR, values of 5.6, or 7 dry and 3, 4, or 5 moist, and chromas of 2, 3, or 4. The organic matter content of the upper 8 inches, after mixing, will not exceed 1 percent as the dark colors are inherited from parent rock materials. Texture of the B2 horizon ranges from clay loam to clay. The caliche of the Cca horizon is usually strongly cemented and, in the gravelly and stony loams, it is indurated. Where coarse fragments are present, their content increases with increasing depth within the profile. Types and phases include sandy loam and gravelly, stony, and very stony loams.

Competing Series and Their Differentiae: There are no other series in this family at the present time.

Setting: Timpahute soils are on smooth, nearly level to moderately sloping low terrace with gradients between 2 and 8 percent, but averaging 2 to 4 percent. These soils have developed in Tertiary Valley fill deposits that have been derived predominantly from basalt with some admixture of tuff and limestone. The climate is semi-arid having a mean annual rainfall of 6 to 8 inches. The average January temperature is 28°F to 30°F, the July average is 73°F, and the mean annual temperature is 52°F. The frost-free season is about 115 to 150 days. The elevation ranges from 4,800 to 5,500 feet.

Principal Associated Soils: Common associates of Timpahute series are Dixie, Neola, and Heist series. Dixie soils (Sierozems) lie at slightly lower elevations and have moderate B2 horizons and prominent, weakly to strongly cemented Cca horizons. Neola soils (Calcisols) lack B1 horizons and have prominent strongly cemented Cca horizons. Heist soils (Calcisols) also lack B2 horizons, have weak Cca horizons, and are moderately coarse textured.

Drainage and Permeability: Well drained. Surface runoff is very slow to medium, depending upon slope. Permeability is slow through the B2 horizons, and very slow through the cemented Cca horizon.

Use and Vegetation: These soils are used only for grazing. Production is low to good and is used for grazing the year around. The vegetation is made up of varying percentages of black sage (*Artemisia arbuscula*) subsp. *nova*), galleta grass (*Hilaria jamesii*), wolfberry (*Lycium andersonii*), four-winged saltbush (*Atriplex canescens*), desert needlegrass (*Stipe speciosa*), blue grama grass (*Boutelona gracilis*), and big sage (*Artemisia tridentata*). The plant density ranges from 10 to 20 percent.

Distribution and Extent: Mapped in southwestern Utah and adjacent area in Nevada.

Series Established: Pahranagat Valley SCD, Nevada, 1940. This Timpahute series was described on the NTS Area 18, Nye County, Nevada, 1966.

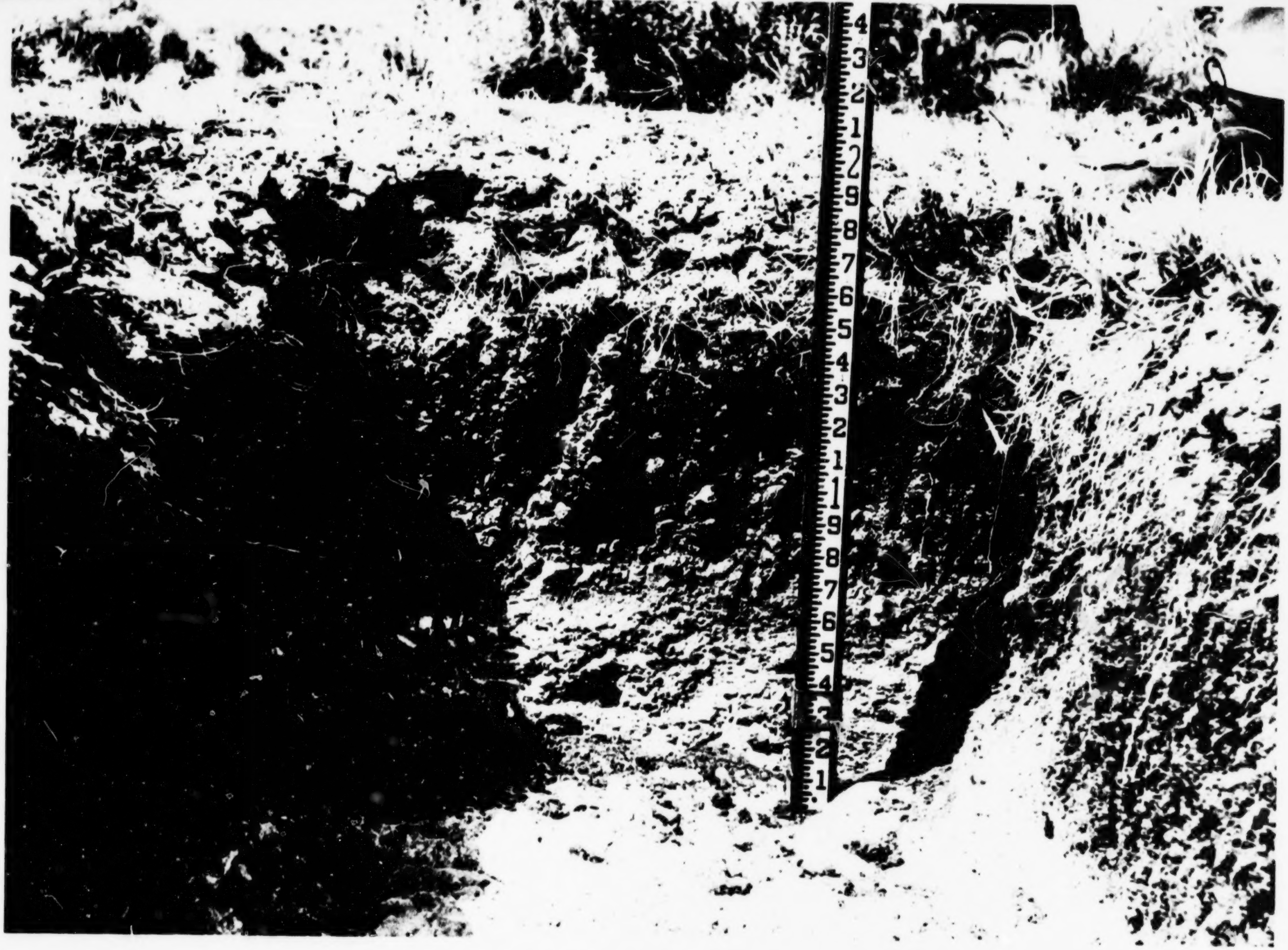
4 3 2 1 2 9 8 7 6 5 4 3 2 1 1 9 8 7 6 5 4 3 2 1

FIGURE 4. Typical profile of Tippipah series
(Hole #4; 3gF3R-Tp, TmC2; Haplic Durargids; bottom of hole is silica-lime pan.)

TIPPIPAH SERIES

Survey Hole No. 4

The Tippipah series is a member of loamy, mixed, mesic family of Haplic Durargids. The Tippipah soils typically have brown A1 horizons and are shallow or moderately deep over an indurated hardpan.

Typifying Pedon: Tippipah gravelly sandy clay loam (virgin) (Colors for dry conditions unless otherwise noted). Surface covered with gravel, cobbles and some stones (desert pavement). (This Tippipah profile was described on NTS.)

A1 0 to 2 inches-Brown (10YR 5/3) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; very few fine and medium roots; many fine and medium tubular and interstitial pores; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary. (1 to 3 inches thick.)

A2 2 to 8 inches-Pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; strong medium platy structure; soft, friable, nonsticky, nonplastic; few fine and medium roots; many fine and medium tubular and vescicular pores; slightly effervescent; moderately alkaline (pH 8.2); clear wavy boundary. (2 to 8 inches thick.)

B2 8 to 16 inches-Reddish brown (5YR 5/4) light clay, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; slightly hard, friable, sticky, plastic; abundant fine and very fine and few medium roots; common fine and medium tubular pores; common thin clay films on peds and in pores; slightly effervescent moderately alkaline (pH 8.2); clear wavy boundary. (4 to 10 inches thick.)

C1 16 to 26 inches-Pale brown (10YR 6/3) with few fine distinct white (10YR 8/2) lime streaks, gravelly sandy loam, brown (10YR 4/3) moist; massive, slightly hard, friable, nonsticky, nonplastic; very few fine roots; very few fine tubular pores; violently effervescent; moderately alkaline (pH 8.2)

C2si 26 inches +-Silica hardpan.

Type Location: About 400 feet east and 300 feet south of the northwest corner of section 31, T. 3S., R. 55E., Mount Diablo Base and Meridian, Lincoln County, Nevada. (This location is for original series.)

Type Location: On the Nevada Test Site in Area 18 about ½ mile north of end of asphalt on Well 8 road (on east side).

Range in Characteristics: -Thickness of the solum ranges from 24 to 30 inches. Color of the A1 horizon includes values of 5 to 7 dry and 3 to 5 moist, and chromas of 2 to 4. Structure is either weak to strong, medium or thick platy or is massive. The organic matter content ranges from 0.3 to 0.5 percent. An A2 or A and B horizon is present. The color of the A2 horizons is similar in color to the A1 horizon or is ½ unit in value lighter. Color of the B2 horizons includes hues of 5YR, 7.5YR, and 10YR, values of 6 to 5 dry and 5 to 3 moist, and 4 to 3. Texture of the B2 horizons includes sandy clay loam, clay loam or clay with a clay content of 25 to 50 percent. Up to 25 percent gravel may be included. Structure in the upper part of the B2 horizon includes strong to moderate, medium to coarse, columnar, prismatic or subangular blocky. The C horizon colors include values of 6 to 8 dry and 4 to 5 moist, and chromas of 2 to 3 depending upon the amount of lime present. Very weak to weakly cemented duripans are present either immediately below the B horizons or within 48 inches. These range in consistence from hard to very hard and friable to firm. Thin discontinuous lenses may be included that are harder and firmer. The gravel content of the unrelated C materials ranges from 65 to 85 percent. The calcium carbonate content of the C horizons range from a trace to 10 percent. Except for the B horizons, the cation exchange capacity of the profile is in excess of

150 me/100 grams of clay. The pH values of the soil range from 7.8 to 9.6 with the highest values normally occurring in the B2 horizons.

Competing Series and Their Differentiae: The Belted and Monte Cristo series are included in the same family with the Tippipah. The Belted soils differ by having a C horizon over II C horizon that have relic high chroma mottles resulting from past high water table conditions. Monte Cristo soils differ by having 14-to 22-inch sola, being derived from mixed rocks including limestone, dolomite, and calcareous silt stone, and having a calcium carbonate equivalent greater than 5 percent throughout the profile.

Setting: Tippipah soils are on smooth to slightly convex, nearly level to gently sloping alluvial fans and low terraces with a slope gradient of ½ to 2 percent, but averaging about 1 percent. The parent materials have been derived principally from basalt rhyolitic tuff and andesite. The climate is semi-arid having a mean annual rainfall of 6 to 8 inches with warm summers and cool winters. The mean annual air temperature is 52°F, average January temperature is 35°F, and average July temperature is 72°F; and the frost-free period is 130 to 150 days.

Principal Associated Soils: Common associates of the Tippipah series are Papoose, and Fang. Papoose are minimal desert soils, and Fang, alluvial soils. They are associated and somewhat similar to Tickapoo soils that differ by lacking columnar structured B2t horizons containing over 15 percent exchangeable sodium. They are similar to the Godecke soils that differ by having darker colored (5.5 to 6.5 dry values) A1 horizons containing over 0.5 percent organic matter.

Drainage and Permeability: Well drained. Runoff is very slow. Permeability is moderately slow through the B2t horizon and rapid to moderately slow through the C horizons depending upon the degree of cementation.

Use and Vegetation: Used for cattle grazing the year around. Production is fair to good. The vegetation is made up of varying percentages of wolfberry (*Lycium andersonii*), small rabittbrush (*Chrysothamnus viscidiflorus*), galleta (*Hilaria jamesii*), squirrel tail (*Sitanion* *hystrix*) black sage (*Artemisia arbuscula* subsp. *nova*), Nevada joint-fir (*Ephedra nevadensis*), globe mallow (*Sphaeralcea grossulariaefolia*), brome grass (*Bromus tectorum*), sand dropseed (*Sporobolus cryptandrus*), blue grama grass (*Boutelona gracilis*), winter fat (*Eurotia lanata*), and loco weed (*Astragalus lentiginosus*). The plant density ranges from 4 to 10 percent.

Distribution and Extent: Mapped in Penoyer Valley, Lincoln County, Nevada, and Area 18. The series is of moderate extent.

Series Proposed: Pahranagat and Penoyer Valley soil survey area, Lincoln County, Nevada, 1959. Tippipah is the name of a local spring.

Remarks: These soils are classified as Haplic Durargids, members of a loamy, mixed, mesic family in accordance with the 7th Approximation.

WILDCAT SERIES

Survey Hole No. 1

The Wildcat series is a member of a sandy, mixed, nonacid, mesic family of Durorthidic Torripsamments. The Wildcat soils typically have wind deposited light gray or very pale brown, loamy fine sand, C horizons superimposed over loamy materials containing white, silica-lime cemented loamy fine sand horizons. They are predominately loamy fine sand textured in the control section and slightly calcareous throughout the profile.

Typifying Pedon: Wildcat medium sand (virgin)
(Colors for dry conditions unless otherwise noted.)

A1 0 to 3 inches-Light gray (10YR 7/2) medium sand, dark grayish brown (10YR 4/2) moist; single grain, loose when dry and moist; nonsticky, nonplastic; few fine, very fine and micro-roots; few fine interstitial pores; slightly effervescent; mildly alkaline (pH 7.6); clear smooth boundary. (2 to 6 inches thick.)

C1 3 to 8 inches-Light gray (10YR 7/2) medium sand; dark grayish brown (10YR 4/2) moist; single grain, loose when dry and moist; nonsticky, nonplastic; abundant fine very fine and micro-roots; few fine interstitial pores; slightly effervescent; mildly alkaline (pH 7.6); clear smooth boundary. (4 to 10 inches thick.)

C2 8 to 27 inches-Very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; weak fine subangular blocky structure breaking to single grain, loose when dry and moist; nonsticky, nonplastic; few fine and medium roots; few fine interstitial pores; slightly effervescent;

mildly alkaline (pH 7.8); abrupt wavy boundary. (12 to 24 inches thick.)

C3 27 to 36 in +-White (10YR 8/2) silica cemented fine sand, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; slightly effervescent; moderately alkaline (pH 8.0).

Type Location: The site is located approximately ½ mile west of the highway going to Pahute Control Point and 2 miles southeast of the airport-Rainier Mesa highway junction. It is near a UCLA study area in Area 18.

Range in Characteristics: Average annual soil temperature at a depth of 20 inches is less than 65°F, and greater than 47°F. The soil is usually dry for six months or more during most years, mainly during the spring and fall months. Mineralogy is mixed. The pH values range from 7.6 to 8.0. Loamy fine sand is the only type recognized. Depth to the silica-lime cementation ranges from 24 to 42 inches. Color of the sandy material includes hues of 10YR; values of 7 dry and 4 or 5 moist; and chromas of 2 or 3. Color of the silica-lime cemented sands includes hues of 10YR, values of 8 dry and 6 moist, and chromas of 2.

Competing Series and Their Differentiae: There are no other soils classified in the same family at the present time. The Brazito soils are similar, but differ by being highly calcareous.

Setting: Wildcat soils occur on gently sloping sand dunes and alluvial fans. (2 to 4 percent slope gradients.) The surface may be smooth but is usually undulating and consists of a series of low dunes. These soils have formed in shallow to moderately deep sand wind-deposited materials superimposed over cemented loamy fine sands. The sandy materials were derived from consolidated and unconsolidated sandstone, while the underlying materials are derived from mixed rock sources including tuff, basalt and limestone. These soils are at elevations ranging from 4,800 to 5,200 feet in an semi-arid climate with warm summers and cool winters. The mean annual precipitation is between 8 to 12 inches, and the mean annual air temperature is between 50° and 60°F. The average monthly temperature ranges from 35°F to 38°F in January, and 69°F to 72°F in July. The frost-free season ranges from 130 to 150 days.

Principal Associated Soils: Common associates of the Wildcat series are Beatty, Buckboard, and Bullfrog. Beatty soils occur in dry washes and differ by having very gravelly sandy control sections. Buckboard soils differ by having a vesicular coarse platy A2 horizon. Bullfrog soils differ by having a silica-lime hardpan.

Drainage and Permeability: Well to excessively drained. Surface runoff is slow. Permeability is rapid.

Use and Vegetation: The vegetation consists primarily of small rabbitbrush (*Chrysothamnus stenophyllus*), perennial buckwheat (*Eriogonum ovalifolium*), Indian ricegrass (*Oryzopsis hymenoides*), cliff rose (*Cowania mexicana* var. *stansburiana*), juniper (*Juniperus osteosperma*), four-winged saltbush (*Atriplex canescens*), pale evening-primrose (*Oenothera pallida*), and hairy balsamroot (*Balsamorhiza hirsuta*). Available forage is used to provide very limited livestock grazing. The plant density is about 10 percent, except in years having good, average, or above average late winter rains when annuals predominate the site.

Distribution and Extent: Mapped in Area 18, but may be found in areas adjacent to the Nevada Test Site. The series is not extensive.

Series Proposed: Area 18 of Nevada Test Site, Nye County, Nevada, 1967. Wildcat is the name of a mountain peak near the Nevada Test Site.

FIGURE 5. AEC beef cattle ranging in Area 18, Well 3 road

V. SOIL CLASSIFICATION SUMMARY

Series	Family	Subgroup	Great Group	Suborder	Order
Bare	loamy skeletal, mixed, mesic	Duric Mollic Camborthids	Camborthids	Orthids	Aridisols
Beatty	sandy skeletal, mixed, nonacid, mesic	Typic Torriorthents	Torriorthents	Orthents	Entisols
Big Butte	fine loamy, mixed, mesic	Lithic Argixerolls	Argixerolls	Xerolls	Mollisols
Buckboard	fine loamy, mixed, mesic	Haplic Durorthids	Durorthids	Orthids	Aridisols
Bullfrog	fine montmorillonitic, mesic	Haplic Mollic Durargids	Durargids	Argids	Aridisols
Echo	fine loamy, mixed, mesic	Lithic Mollic Haplargids	Haplargids	Argids	Aridisols
Eleana	loamy skeletal, mixed, mesic	Typic Haploxerolls	Haploxerolls	Xerolls	Mollisols
Halfpint	sandy skeletal, mixed, nonacid, mesic	Typic Torripsamments	Torripsamments	Psamments	Entisols
Hampel	loamy skeletal, mixed, mesic	Lithic Mollic Camborthids	Camborthids	Orthids	Aridisols
Indian Springs	clayey-skeletal mixed, mesic	Duric Haplargids	Haplargids	Argids	Aridisols

V. SOIL CLASSIFICATION SUMMARY (Continued)

Series	Family	Subgroup	Great Group	Suborder	Order
Keane Spring	sandy, mixed, mesic	Fluventic Haploxerolls	Haploxerolls	Xerolls	Mollisols
Oak Spring	coarse-loamy, mixed mesic	Mollic Camborthids	Camborthids	Orthids	Aridisols
Pahute	loamy-skeletal, mixed, mesic, shallow	Typic Durorthids	Durorthids	Orthids	Aridisols
Ruddle	sandy skeletal, mixed, mesic	Duric Mollic Camborthids	Camborthids	Orthids	Aridisols
Sawtooth	fine loamy, mixed, mesic	Lithic Camborthids	Camborthids	Orthids	Aridisols
Scranton	loamy skeletal, mixed, mesic	Duric Camborthids	Camborthids	Orthids	Aridisols
Timber	fine loamy, mixed, mesic, shallow	Entic Durorthids	Durorthids	Orthids	Aridisols
Timpahute	fine montmorillonitic, mesic	Mollic Durargids	Durargids	Argids	Aridisols
Tippipah	loamy, mixed, mesic	Haplic Durargids	Durargids	Argids	Aridisols
Wildcat	sandy, mixed, non-acid mesic	Durorthidic Torripsamments	Torripsamments	Psamments	Entisols

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APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
BaB2	Bare, gravelly fine sandy loam, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-6" Light brownish gray gravelly fine sandy loam, weak fine subangular blocky structure; soft, friable slightly effervescent moderately alkaline	6-18" Brown, gravelly loam, weak fine subangular blocky structure soft, friable strongly effervescent moderately alkaline	18-50"+ Light yellowish brown, very gravelly sandy loam, with white silica streaks, massive loose dry and moist violently effervescent moderately alkaline	Rangeland Capability VIIsL	Moderate	Low	Over 60	Well	Slow to very slow	3.0 to 4.5
BcB2	Beatty, gravelly loamy sand, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-5" Brown, gravelly loamy sand, very weak fine subangular blocky structure, soft very friable slightly effervescent, moderately alkaline	5-18" Brown very gravelly sandy loam, massive, soft, very friable, slightly effervescent, moderately alkaline	18-60" Light gray very gravelly loamy sand-single grain, loose when dry and moist, strongly effervescent and alkaline	Rangeland VIIsL	Moderate	Low	Over 60	Excessive	Very slow	3.0 to 4.5
BdB2	Beatty, gravelly sandy loam, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-5" Brown gravelly sandy loam weak fine subangular blocky structure soft very friable, slightly effervescent, moderately alkaline	5-18" Brown very gravelly sandy loam, massive, soft, very friable, slightly effervescent, moderately alkaline	18-60" Light gray very gravelly loamy sand-single grain, loose when dry and moist, strongly effervescent and alkaline	Rangeland VIIsL	Moderate	Low	Over 60	Well	Slow to very slow	3.0 to 4.5
BeC2	Big Butte, gravelly loam, moderate erosion, 2 to 8 percent slopes	Smooth gently to moderately sloping low terraces	0-3" Grayish brown gravelly loam, weak coarse subangular blocky structure, soft, friable slightly effervescent moderately alkaline	3-13" Reddish brown gravelly sandy clay loam, strong coarse subangular blocky structure hard, friable clay films slightly effervescent, moderately alkaline	13"+ Basalt Bedrock	Rangeland VIIs8	Moderate	Low	4-13	Well	Medium to rapid	2.0 to 4.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
BfC2	Buckboard, gravelly sandy clay loam, moderate erosion, 2 to 8 percent slopes	Smooth to slightly convex strongly dissected old alluvial fans	0-4" Light brownish gray, gravelly loam weak coarse platy breaking to subangular blocky structure soft, friable, slightly effervescent, moderately alkaline	4-13" Pale brown light sandy clay loam weak fine subangular blocky structure, soft, friable, strongly effervescent moderately alkaline	13-48"+ White very coarse sand, massive, hard friable, strongly effervescent, moderately alkaline thin silica-lime, hardpan layers	Rangeland VIIe8	Moderate	Low	4 - 13	Well	Rapid	2.0 to 4.0
BgC2	Buckboard, stony clay loam moderate erosion, 2 to 8 percent slopes	Smooth to slightly convex strongly dissected old alluvial fans	0-4" Light brownish gray, stony loam weak coarse platy breaking to subangular blocky structure soft, friable, slightly effervescent, moderately alkaline	4-13" Pale brown light sandy clay loam weak fine subangular blocky structure, soft, friable, strongly effervescent moderately alkaline	13-48"+ White very coarse sand, massive, hard friable, strongly effervescent, moderately alkaline thin silica-lime, hardpan layers	Rangeland VIIs7	Moderate	Low	4 - 13	Well	Rapid	2.0 to 4.0
BhE2	Buckboard, gravelly sandy clay loam, moderate erosion, 8 to 30 percent slopes	Steep to slightly convex strongly dissected old alluvial fans	0-4" Light brownish gray, stony loam weak coarse platy breaking to subangular blocky structure soft, friable, slightly effervescent, moderately alkaline	4-13" Pale brown light sandy clay loam weak fine subangular blocky structure, soft, friable, strongly effervescent moderately alkaline	13-48" White very coarse sand, massive, hard friable, strongly effervescent, moderately alkaline thin silica-lime, hardpan layers	Rangeland VIIe8	Moderate	Low	4 - 13	Well	Rapid	2.0 to 4.0
BkE2	Buckboard, gravelly stony loam, moderate erosion, 8 to 30 percent slopes	Smooth to slightly convex strongly dissected old alluvial fans	0-4" Light brownish gray, stony loam weak coarse platy breaking to subangular blocky structure soft, friable, slightly effervescent, moderately alkaline	4-13" Pale brown light sandy clay loam weak fine subangular blocky structure, soft, friable, strongly effervescent moderately alkaline	13-48" White, very coarse sand, massive, hard friable, strongly effervescent, moderately alkaline thin silica-lime, hardpan layers	Rangeland VIIe8	Moderate	Low	4 - 13	Well	Rapid	2.0 to 4.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
BmE4	Buckboard, gravelly stony loam, severe erosion, 8 to 30 percent slopes	Steep slightly convex strongly dissacted old alluvial fans	0-4" Light brownish gray, stony loam weak coarse platy breaking to subangular blocky structure soft, friable, slightly effervescent moderately alkaline	4-13" Pale brown light sandy clay loam weak fine subangular blocky structure, soft, friable, strongly effervescent moderately alkaline	13-48" White very coarse sand, massive, hard friable, strongly effervescent, moderately alkaline thin silica-lime hardpan layers	Rangeland VIIe1	Moderate	Low	4 - 13	Well	Rapid	2.0 to 4.0
BmF2	Bullfrog, gravelly and cobbly loam, 15 to 45 percent slopes moderate erosion	Steep hill slopes	0-9" Brown, weak fine subangular blocky, soft, very friable, strongly effervescent	9-20" Pale brown gravelly and cobbly silty clay loam, weak fine subangular blocky, soft, friable strongly effervescent	20-40" Light reddish brown clay strong coarse prismatic slightly hard, friable, strongly effervescent, many thin clay films on peds and in pores	Rangeland VIIe8	Moderate	Medium	36 - 60 Deep	Well	Medium	6.0 to 7.0
BoC2	Bullfrog, gravelly and cobbly loam, moderate erosion, 2 to 8 percent slopes	Convex rolling hills	0-9" Brown, weak fine subangular blocky, soft, very friable, strongly effervescent	9-20" Pale brown gravelly and cobbly silty clay loam, weak fine subangular blocky, soft, friable strongly effervescent	20-36" Light reddish brown clay strong coarse prismatic slightly hard, friable, strongly effervescent, many thin clay films on peds and in pores	Rangeland VIIs8	Moderate	Medium	20 - 36	Well	Medium	5.0 to 6.0
BpE2	Bullfrog, stony clay loam, moderate erosion, 8 to 30 percent slopes	Steep to moderately sloping high terrace	0-9" Brown, weak fine subangular blocky, soft, very friable, strongly effervescent	9" Bedrock		Rangeland VIIs8	Moderate	Medium	4 - 10	Well	Medium	2.0 to 3.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
EaE2	Echo, stony and gravelly clay loam, moderate erosion, 8 to 30 percent slopes	Steep to moderately sloping high terraces	0-3" Pale brown stony and gravelly clay loam, moderate coarse platy structure soft, friable, slightly effervescent, moderately alkaline	3-8" Reddish brown gravelly clay loam moderate medium slightly effervescent, moderately alkaline subangular blocky structure, slightly hard, friable, common thin clay films on peds and in pores	8"+ Basalt Bedrock	Rangeland VIIe8	Moderate	Medium	1 - 10	Well	Medium to rapid depending on the slope	3.0 to 4.0
EcF2	Echo stony and gravelly clay loam, moderate erosion, 15 to 45 + percent slope	Steep to moderately sloping high terraces	0-3" Pale brown stony and gravelly clay loam, moderate coarse platy structure, soft friable, slightly effervescent, moderately alkaline	3-8" Reddish brown gravelly clay loam moderate medium slightly effervescent, moderately alkaline subangular blocky structure, slightly hard friable, common thin clay films on peds and in pores	8"+ Basalt Bedrock	Rangeland VIIe8	Moderate	Medium	1 - 10	Well	Medium to rapid depending on the slope	3.0 to 4.0
EdF2	Eleana very stony sandy loam, moderate erosion, 15 to 45 + percent slopes	Steep hilly slopes	0-4" Brown very stony sandy loam moderate medium subangular blocky structure, soft, friable slightly effervescent moderately alkaline	4-13" Reddish brown gravelly sandy clay loam, moderate medium subangular blocky structure, slightly hard, friable, slightly effervescent, mildly alkaline	13-48"+ Very pale brown silica-lime cemented gravel, massive, firm dry and moist, strongly to violently effervescent, mildly alkaline (silica-lime)	Rangeland VIIe8	Moderate	Low	10 - 20	Well	Rapid	2.0 to 3.0
HaB2	Halfpint, fine sand 0-4 percent slopes moderate erosion	Convex low sand dunes	0-12" Very pale brown, fine sand single grain, loose noneffervescent	12-60"+ Light brown gray fine sand single grain, loose, slightly effervescent		Rangeland Capability VIIsL	Moderate	Very Low	over 60	Excessive	Very slow	3.0 to 4.5

APPENDIX I. SOIL CHARACTERIST ICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
HcB2	Halfpint, gravelly loamy sand, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-5" Very pale brown gravelly loamy sand weak fine subangular blocky structure beaking to single grain, soft friable, slightly effervescent moderately alkaline	5-48"+ Very pale brown, gravelly loamy sand, weak fine subangular blocky structure breaking to single grain, soft, friable strongly effervescent, moderately alkaline		Rangeland VIIsL	Moderate	Very low	Over 60	Well to somewhat excessive	Very slow	2.0 to 3.5
HdF2	Hampel stony loam, moderate erosion, 15 to 45+ percent slopes	Steep mountain slopes	0-5" Light brownish gray, very stony loam, weak medium subangular, blocky structure, soft friable, strongly effervescent, moderately alkaline	5-9" Light reddish brown, gravelly clay loam, strong coarse subangular blocky structure, hard, friable, slightly effervescent, mildly alkaline	9"+ Very pale brown tuff bed - rock, massive, very firm, dry and moist, strongly effervescent, moderately alkaline	Rangeland VIIe8	Moderate	Low	4-10	Well	Rapid because of slope	2.0 to 3.0
HeF2	Hampel stony clay loam, moderate erosion 15 to 45+ percent slopes	Steep to very steep mountain slopes	0-5" Light brownish gray, very stony loam, weak medium subangular blocky structure, soft friable, strongly effervescent, moderately alkaline	5-9" Light reddish brown, gravelly clay loam, strong coarse subangular blocky structure, hard, friable, slightly effervescent, mildly alkaline	9"+ Very pale brown tuff bedrock, massive, very firm, dry and moist, strongly effervescent, moderately alkaline	Rangeland VIIe8	Moderate	Low	4-10	Well	Rapid because of slope	2.0 to 3.0
IaC2	Indian Springs, gravelly clay, moderate deep over hardpan, moderate erosion 2 to 8 percent slopes	Smooth gently to moderately sloping alluvial fans	0-4" Very pale brown gravelly loam, moderate coarse platy structure, soft, friable, slightly effervescent, moderately alkaline	4-12" Reddish brown, gravelly clay, strong coarse subangular blocky structure, hard friable clay films, slightly effervescent, moderately alkaline	12-43"+ Light reddish brown gravelly and cobbly clay with silica-lime white streaks moderate coarse subangular blocky structure, hard, friable, clay films, slightly to strongly effervescent, moderately to strongly alkaline	Rangeland VIIs8	Moderate	High	20-36	Well	Moderately rapid to rapid	4.0 to 6.0

APPENDIX I. SOIL CHARACTE RISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
KaB2	Keane Spring, loamy sand, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to sloping alluvial fans	0-5" Dark grayish brown, loamy sand, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	5-40" Dark gray loamy sand, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	40"+ White cobbly gravelly sand, single grain, loose when dry and moist, violently effervescent, strongly alkaline, cobbles are covered with silica-lime on all sides	Rangeland VII	Moderate	Low	Over 60	Well	Very slow	3.0 to 4.0
OaB2	Oak Spring gravelly loamy sand, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-8" Light brownish gray gravelly loamy sand, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-44" Very pale brown cobbly and gravelly loamy sand, massive loose when dry and moist, violently effervescent, strongly alkaline	44-60" Light reddish brown gravelly fine sandy loam, strong coarse subangular blocky structure, hard friable, slightly effervescent, moderately alkaline	Rangeland VIIs1	Moderate	Low	Over 60	Well	Very slow	2.0 to 3.5
OcB2	Oak Spring gravelly fine sandy loam, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping alluvial fans	0-8" Light brownish gray gravelly fine sandy loam, weak fine subangular blocky structure soft, friable, slightly effervescent moderately alkaline	8-44" Very pale brown cobbly and gravelly loamy sand, massive loose when dry and moist, violently effervescent, strongly alkaline	44-60" Light reddish brown gravelly fine sandy loam, strong coarse subangular blocky structure, hard friable, slightly effervescent, moderately alkaline	Rangeland VIIs1	Moderate	Low	Over 60	Well	Very slow	3.0 to 4.5
PaB2	Pahute gravelly loam shallow over hardpan, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to gently sloping low terraces and convex hill tops.	0-4" Light gray gravelly loam, moderate medium platy structure, soft, friable, vesicular pores, slightly effervescent moderately alkaline	4-12" Light reddish brown gravelly sandy clay loam, moderate medium subangular blocky structure slightly hard, friable, slightly effervescent moderately alkaline	12"+ White silica-lime cemented gravel-tuff massive very firm dry and moist, violently effervescent, moderately alkaline	Rangeland VIIs8	Moderate	Low	10-20	Well to moderately well	Medium	2.0 to 4.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
PcE2	Pahute gravelly loam shallow over hardpan, moderate erosion, 2 to 8 percent slopes	Smooth nearly level to gently sloping low terraces and convex hill tops	0-4" Light gray gravelly loam, moderate medium platy structure, soft, friable, vesicular pores, slightly effervescent moderately alkaline	4-12" Light reddish brown gravelly sandy clay loam, moderate medium subangular blocky structure slightly hard, friable, slightly effervescent moderately alkaline	12"+ White silica-lime cemented gravel-tuff, massive very firm dry and moist, violently effervescent, moderately alkaline	Rangeland VIIs8	Moderate	Low	4-10	Well to moderately well	Medium	2.0 to 4.0
RaE2	Rockland (Tuff material)	Steep mountains	0-10" Stony loam	Tuff, basalt and limestone outcrops		Rangeland Capability VIIIs8	Moderate to severe	Low	Very shallow	Well	Rapid	0 to 1.0
RcF2	Rockland (Tuff material)	Steep mountains	0-10" Stony loam	Tuff, basalt and limestone outcrops		Rangeland Capability VIIIs8	Moderate to severe	Low	Very shallow	Well	Rapid	0 to 1.0
RdB2	Ruddle gravelly loamy sand, moderate erosion 0 to 4 percent slopes	Smooth nearly level to moderate sloping flood plains and alluvial fans	0-4" Light brownish-gray gravelly loamy sand, weak, fine subangular blocky structure, soft, very friable, strongly effervescent moderately alkaline	4-12" Light brownish gray cobbly and gravelly sandy loam, weak fine subangular blocky structure, soft, very friable, violently effervescent moderately alkaline	12-50"+ Light gray cobbly gravelly sand, single grain, loose dry and moist, violently effervescent, moderately alkaline	Rangeland VIIs1	Moderate	Low	Over 60	Well to excessive	Very slow	2.0 to 3.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
ReB2	Ruddle gravelly sandy loam, moderate erosion, 0 to 4 percent slopes	Smooth nearly level to moderate sloping flood plains and alluvial fans	0-4" Light brownish gray gravelly sandy loam, weak fine subangular blocky structure, soft, very friable, strongly effervescent moderately alkaline	4-12" Light brownish gray cobbly and gravelly sandy loam, weak fine subangular blocky structure, soft, very friable, violently effervescent moderately alkaline	12-50"+ Light gray cobbly gravelly sand, single grain, loose dry and moist, violently effervescent, moderately alkaline	Rangeland VIIs1	Moderate	Low	Over 60	Well	Very slow	3.0 to 4.0
RfC2	Ruddle gravelly sandy loam, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	Smooth gently to moderately sloping alluvial fans	0-4" Light brownish gray gravelly sandy loam, weak fine subangular blocky structure soft, very friable, strongly effervescent moderately alkaline	4-30" Light brownish gray cobbly and gravelly sandy loam, weak fine subangular blocky structure, soft, very friable, violently effervescent moderately alkaline	30"+ Silica-lime hardpan	Rangeland VIIs4	Moderate	Low	20-36	Well	Very slow	3.0 to 4.0
SaE2	Sawtooth stony sandy clay loam, moderate erosion 8 to 30 percent slopes	Rolling hill top and side slopes	0-4" Light gray stony sandy clay loam, strong coarse platy structure soft friable, vesicular pores, slightly effervescent moderately alkaline	4-8" Light reddish brown, sandy clay loam, moderate medium subangular blocky structure; slightly sticky, slightly plastic very few fine and medium roots, common fine and medium tubular pores; slightly effervescent moderately alkaline	8"+ Basalt Bedrock	Rangeland VIIs8	Moderate	Low	4-10	Well	Medium to rapid	2.0 to 3.0

APPENDIX I. SOIL CHARACTER ISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
ScE2	Scranton stony sandy clay loam, moderate erosion 8 to 30 percent slopes	Steep to moderately hill slopes	0-5" Very pale brown stony sandy clay loam, moderate medium subangular blocky structure soft, friable, vesicular pores, slightly effervescent moderately alkaline	5-11" Brown sandy clay loam, stony coarse subangular blocky structure, slightly hard, friable, slightly effervescent, moderately alkaline	11-32" Gravelly clay loam to very cobbly sandy loam, with white silica-lime streaks, massive, slightly hard, friable, violently effervescent, moderately alkaline Basalt bedrock at 32"+	Rangeland VIIe8	Moderate	High	20-36	Well	Medium to rapid	3.0 to 4.0
SdF2	Scranton stony sandy clay loam, moderate erosion 8 to 30 percent slopes	Steep to very steep hill slopes	0-5" Very pale brown stony sandy clay loam, moderate medium subangular blocky structure soft, friable, vesicular pores, slightly effervescent moderately alkaline	5-11" Brown sandy clay loam, stony coarse subangular blocky structure, slightly effervescent, moderately alkaline	11" Bedrock	Rangeland VIIe8	Moderate	High	4-10	Well	Medium to rapid	2.0 to 3.0
TaE2	Timber stony clay loam, moderate erosion 8 to 30 percent slopes	Moderate to steep hills and terraces	0-6" Very pale brown, stony clay loam, strong medium platy breaking to strong coarse subangular blocky structure, soft, friable, violently effervescent moderately alkaline	6-12" Reddish brown loam, moderate medium subangular blocky structure, slightly hard, friable slightly effervescent moderately alkaline	12"+ White silica-lime hardpan, massive, firm when dry and moist, violently effervescent strongly alkaline	Rangeland VIIe8	Moderate	High	4-10	Well	Medium	2.0 to 3.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
TcC2	Timpahute, gravelly sandy clay loam, moderate deep over hardpan moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown gravelly clay loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderately alkaline	20"+ Very pale brown gravelly loam -silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	High	20-36	Well	Very slow to medium	3.0 to 5.0
TdC2	Timpahute, gravelly clay moderately deep over hardpan, moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown clay, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderately alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	High	20-36	Well	Very slow to medium	3.0 to 5.0
TeC2	Timpahute, gravelly sandy clay loam, shallow depth over hardpan, moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown gravelly clay loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderately alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	High	10-20	Well	Very slow to medium	3.0 to 4.0
TbC2	Timpahute, gravelly sandy clay loam, shallow depth over hardpan, moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown gravelly clay loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderately alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	High	10-20	Well	Very slow to medium	3.0 to 4.0

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Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
TfE2	Timpahute, stony loam moderate erosion, 8 to 30 percent slopes	Moderate to steep sloping terraces	0-8" Pale brown stony loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20"Reddish brown, clay, strong very coarse prismatic structure slightly hard, friable, clay films, strongly effervescent moderate alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIe8	Moderate	High	4-10	Well	Very slow to medium	2.0 to 3.0
TgC2	Timpahute, gravelly clay loam, moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown gravelly clay loam, weak fine subangular blocky structure, soft friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, slightly effervescent moderate alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	High	4-10	Well	Very slow to medium	2.0 to 3.0
ThC2	Timpahute, stony clay loam, moderate erosion, 2 to 8 percent slopes	Gently to moderately sloping low terraces	0-8" Pale brown stony clay loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderate	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIs7	Moderate	High	4-10	Well	Very slow to medium	2.0 to 3.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Symbol	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
TkE2	Timpahute, stony clay loam, moderate erosion, 8 to 30 percent slopes	Moderate to steep sloping terraces	0-8" Pale brown stony clay loam, weak fine subangular blocky structure, soft, friable, slightly effervescent moderately alkaline	8-20" Reddish brown clay, strong very coarse prismatic structure, slightly hard, friable, clay films, strongly effervescent moderately alkaline	20"+ Very pale brown gravelly loam-silica-lime hardpan, massive slightly hard, friable, violently effervescent moderately alkaline	Rangeland VIIe8	Moderate	High	4-10	Well	Very slow to medium	2.0 to 3.0
TmC2	Tippipah, gravelly clay loam, moderately deep over hardpan, moderate erosion, 2 to 8 percent slopes	Smooth to slightly convex nearly to gently sloping alluvial fans and low terraces	0-8" Brown gravelly clay loam weak subangular blocky soft, friable, slightly effervescent, moderately alkaline	8-16" Reddish brown light clay strong medium subangular blocky slightly hard, friable, slightly effervescent, moderately alkaline	16-26" Pale brown with fine distinct white lime streaks, gravelly sandy loam, massive slightly hard, friable, violently effervescent moderately alkaline (26"+ Silica hardpan)	Rangeland VIIs8	Moderate	Low	20-36	Well	Very slow	3.0 to 4.0
TnC2	Tippipah, gravelly loam moderate erosion, 2 to 8 percent slopes	Smooth to slightly convex nearly level to gently sloping alluvial fans and low terraces	0-8" Brown gravelly loam weak subangular blocky soft, friable slightly effervescent moderately alkaline	8-16" Reddish brown light clay strong medium subangular blocky slightly hard, friable, slightly effervescent, moderately alkaline	26"+ Silica hardpan pale brown with fine distinct white lime streaks, gravelly sandy loam, massive slightly hard, friable violently effervescent moderately alkaline	Rangeland VIIs8	Moderate	Low	4-10	Well to excessively	Slow	3.0 to 4.0

APPENDIX I. SOIL CHARACTERISTICS AND INTERPRETATIONS

Soil Name	Soil Name	Position	Surface Layer	Subsoil	Substratum	Present Use & Capability Classification	Erosion Hazard	Fertility	Effective Depth (inches)	Natural Drainage	Runoff	AWC (inches)
WaC2	Wildcat, loamy fine sand moderate deep over hardpan moderate erosion, 2 to 8 percent slopes	Gently sloping sand dunes and alluvial fans	0-8" Light gray loamy fine sand, single grain, loose when dry and moist, slightly effervescent mildly alkaline	8-27" Very pale brown, loamy fine sand, weak fine subangular blocky breaking to single grain, loose when dry and moist, slightly effervescent, milkly alkaline	27-36"+ White silica cemented loamy fine sand moderate medium subangular blocky slightly hard, friable, slightly effervescent, moderately alkaline	Rangeland VIIs4	Moderate	Very low	20-36	Well to excessively	Slow	3.0 to 4.0

APPENDIX II. Physical Analysis of Soils

Soil	Hori-zon	Depth (Inches)	Textural Class	Gravel (%)	Very Coarse Sand (2.0 to 1.0 mm) (%)	Coarse Sand (1.0 to 0.5 mm) (%)	Medium Sand (0.5 to 0.25 mm) (%)	Fine Sand (0.25 to 0.10 mm) (%)	Very fine Sand (0.10 to 0.05 mm) (%)	Silt (0.05 to 0.002 mm) (%)	Clay (<0.002mm) (%)
				Particle-size Distribution							
Bare gravelly fine sandy loam BaB2 Location:Area 18 NTS Survey Hole No.:35 Lab. No.:368-371	A1	0-6	gravelly fine sandy loam	43	17	9	5	9	20	30.5	9.5
	C1	6-12	sandy loam	14	19	14	8	11	16	23.5	9.5
	C2	12-18	gravelly loam	30	12	8	3	6	24	32	15
	C3sica	18-50+	sand	20	4	30	8	7	4	5	2
Beatty gravelly sandy loam BdB2 Location:Area 18 NTS Survey Hole No.:6 Lab. No.:246-249	A1	0-5	gravelly sandy loam	35	7	12	14	18	15	26.5	7.5
	C1	5-18	gravelly sand	31	19	30	21	16.5	5.5	5	3
	C2	18-45	loamy sand	0	0	0	24	31.5	19.5	18.5	6.5
	C3	45-60+	gravelly loamy sand	25	7	14	18	22	11	24	4
Big Butte gravelly fine sandy loam BeC2 Location:Area 18 NTS Survey Hole No.:26 Lab. No.:353-355	A1	0-3	gravelly fine sandy loam	33	13	7	6	10	17	36	11
	B1	3-10	gravelly fine sandy loam	25	22	8	5	8	11	36	10
	B2	10-13	gravelly loam	43	15	5	4	7	10	37	22
	R	13+	Basalt Bedrock								
Buckboard sandy loam BfC2 Location:Area 18 NTS Survey Hole No.:14 Lab. No.: 338,339,406	A1	0-3	fine sandy loam	8	10	15	12	11	6	30	16
	B1	3-9	sandy loam	12	13	20	14	12	6	25	10
	C sica	9-25	silica-lime cemented sand	12	48	18	10	7.5	4	9.5	3
	C2sicam	25+	silica-lime pan								

Soil	Hori-zon	Depth (Inches)	Textural Class	Gravel (%)	Very Coarse Sand (2.0 to 1.0 mm) (%)	Coarse Sand (1.0 to 0.5 mm) (%)	Medium Sand (0.5 to 0.25 mm) (%)	Fine Sand (0.25 to 0.10 mm) (%)	Very fine Sand (0.10 to 0.05 mm) (%)	Silt (0.05 to 0.002 mm) (%)	Clay (< 0.002mm) (%)
				Particle-size Distribution							
Bullfrog gravelly and cobbly loam BnF2 Location: Area 18 NTS Survey Hole No:13 Lab. No.:334-337	A11	0-9	gravelly and cobbly loam	27	6	3	4	12	22	38	15
	A12	9-20	gravelly and cobbly loam	27	13	2	4	13	18	35	15
	B2	20-40	clay loam	6	3	1	2	7	8	44	35
	C3sicam	40+	silica-lime pan	0							
Echo gravelly loam EaE2 Location:Area 18 NTS Survey Hole No.:32 Lab. No.:359-360	A2	0-3	gravelly sandy loam	24	18	9	5	9	17	36	6
	B1	3-8	gravelly loam	20	6	6	5	9	14	40	20
	R	8+	Basalt bedrock								
Eleana stony sandy loam EdF2 Location:Area 18 NTS Survey Hole No.:34 Lab. No.:364-367	A1	0-4	stony sandy loam	12	10	11	11	17	14	30	7
	B2	4-8	sandy clay loam	10	16	13	9	12	6	19	25
	B3	8-13	gravelly sandy loam	32	21	15	13	11	6	24	10
	C3sicam	13-48+	silica-lime pan	22	26	31	17	13	4	7	2
Halfpint gravelly loamy sand HcB2 Location:Area 18 NTS Survey Hole No.:16 Lab. No.:342-343	A1	0-5	gravelly loamy sand	40	23	27	18	15	6	6	6
	C1	5-48+	very gravelly loamy sand	65	30	23	18	14	5	5	5

APPENDIX II. Physical Analysis of Soils

Particle-size Distribution

Soil	Hori-zon	Depth (Inches)	Textural Class	Gravel (%)	Very Coarse Sand (2.0 to 1.0 mm) (%)	Coarse Sand (1.0 to 0.5 mm) (%)	Medium Sand (0.5 to 0.25 mm) (%)	Fine Sand (0.25 to 0.10 mm) (%)	Very fine Sand (0.10 to 0.05 mm) (%)	Silt (0.05 to 0.002 mm) (%)	Clay (< 0.002 mm) (%)
Hampel stony sandy loam HdF2 Location:Area 18 NTS Survey Hole No:44 Lab. No.:381-383	A2	0-5	stony, cobbly sandy loam	17	12	15	12	21	17	15.5	7.5
	B1	5-9	gravelly sandy clay loam	21	10	12	12	18	12	15	21
	R	9+	tuff bedrock								
Indian Springs gravelly clay IaC2 Location:Area 18 NTS Survey Hole No.:30 Lab. No.:294-297	A2	0-4	gravelly sandy loam	23	8	9	15	27	12	21	8
	B1	4-12	gravelly clay	32	5	5	8	18	7	18	39
	B2	12-36	cobbly loam	0	0	0	15	25	13	32	15
	B3	36-43+	gravelly sandy loam	51	11	11	12	25	6	21	14
Keane Spring loamy sand KaB2 Location:Area 18 NTS Survey Hole No.:24 Lab. No.:345-348	A11	0-5	sand	6	19	27	21	17	7	7	2
	A12	5-12	loamy sand	3	17.5	23.1	18.5	16.9	8	12	4
	C1	12-40	loamy sand	11	20	27	19	15	5	10	4
	C2	40+	cobbly, gravelly sand	34	34	30	19	7	2	5	3
Oak Spring fine sandy loam OaB2 Location:Area 18 NTS Survey Hole No.:28 Lab. No.:286-290	A1	0-4	fine sand	8	13	18	24	25	9	6	5
	A2	4-8	fine sandy loam	0	0	0	29	40	13	10	8
	C1	8-15	fine sandy loam	10	10	13	17	25	12	12	11
	C2	15-44	fine sandy loam	16	0	0	25	42	12	16	5
	B1b	44-60	sandy loam	16	4	12	36	21	6	14	8

Particle-size Distribution

Soil	Hori-zon	Depth (Inches)	Textural Class	Gravel (%)	Very Coarse Sand (2.0 to 1.0 mm) (%)	Coarse Sand (1.0 to 0.5 mm) (%)	Medium Sand (0.5 to 0.25 mm) (%)	Fine Sand (0.25 to 0.10 mm) (%)	Very fine Sand (0.10 to 0.05 mm) (%)	Silt (0.05 to 0.002 mm) (%)	Clay (< 0.002 mm) (%)
Pahute gravelly sandy clay loam PaB2 Location:Area 18 NTS Survey Hole No.:43 Lab. No.:379, 380, 403	A2	0-4	gravelly sandy loam	18	12	9	8	18	14	28	11
	B1	4-12	very sandy clay loam	51	12	12	11	18	8	19	20
	Clsicam	12+	silica-lime pan								
Ruddle gravelly fine sand RdB2 Location:Area 18 NTS Survey Hole No.:54 Lab. No.:299-301	A1	0-4	gravelly loamy sand	40	0	0	24	39	16	17	4
	C1	4-12	gravelly fine sand	45	0	1	35	49	9	2	4
	C2	12-50+	cobbly, gravelly sand	49	4	11	24	31	16	10	4
Sawtooth stony loam SaE2 Location: Area 18 NTS Survey Hole No.:45 Lab. No.:398, 404	A2	0-4	stony loam	14	5	3	2	12	20	40	18
	B2	4-8	loam	17	6	4	5	15	16	32	22
	R	8+	tuff bedrock								
Scranton stony fine sandy loam ScE2 Location:Area 18 NTS Survey Hole No.:37 Lab. No.:251, 255-257	A2	0-5	stony fine sandy loam	0	0	0	13	33	14	28	12
	B11	5-11	loam	14	0	0	7	18	15	42	18
	B12	11-18	gravelly loam	45	7	10	13	15	10	32	13
	C1s1	18-32+	very gravelly, and cobbly sandy clay loam	61	9	15	13	12	5	20	26

APPENDIX II. Physical Analysis of Soils

Soil	Hori-zon	Depth (Inches)	Textural Class	Particle-size Distribution (Continued)							
				Gravel (%)	Very Coarse Sand (2.0 to 1.0 mm) (%)	Coarse Sand (1.0 to 0.5 mm) (%)	Medium Sand (0.5 to 0.25 mm) (%)	Fine Sand (0.25 to 0.10 mm) (%)	Very fine Sand (0.10 to 0.05 mm) (%)	Silt (0.05 to 0.002 mm) (%)	Clay (< 0.002 mm) (%)
Timber stony	A2	0-6	stony clay loam	12	5	4	6	17	14	24	30
clay loam TaE2	B1	6-12	loam	13	3	3	7	21	14	30	22
Location:Area 18 NTS	Clsicam	12+	silica-lime pan								
Survey Hole No.:31											
Lab. No.:356-358											
Timpahute gravelly	A2	0-5	gravelly sandy loam	32	9	7	9	20	17	28	10
clay TeC2	B2	5-18	clay	0	4	3	2	5	3	33	50
Location:Area 18 NTS	Clsicam	18+	gravelly clay	42.3	2.5	3.1	3.4	6.5	10.5	28.0	46.0
Survey Hole No.:19											
Lab. No.:291,309 310											
Tippipah sandy	A1	0-3	sandy loam	13	16	13	8	15	10	25	13
clay loam TnC2	A2	3-7	sandy clay loam	7	15	10	8	13	9	18	27
Location:Area 18 NTS	B2	7-11	clay loam	0	8	8	7	15	8	26	32
Survey Hole No.:39	Clsicam	11+	silica-lime pan								
Lab. No.:376, 377, 378, 391											
Wildcat medium	A1	0-3	medium sand	8	6	5	54	29.5	2	1.5	2
sand WaC2	C1	3-8	medium sand	10	3	5	58	26.5	2	2.5	3
Location:Area 18 NTS	C2	8-27	sand	28	3	7	47	32	3.5	2.5	5
Survey Hole No:1	C3	27-36+	gravelly fine sand	36	7	19	27	34	6	6	1
Lab. No.:242-245											

APPENDIX III. Chemical Analysis of Soil Extracts

Soil	Horizon	Depth (Inches)	pH Reaction Paste	pH Reaction Ext	EC Paste	EC Ext	Sat Ext meq/100 Na	Sat Ext meq/100 K	Sat Ext meq/100 Ca	Sat Ext meq/100 Mg	Ext Cations meq/100 Na	Ext Cations meq/100 K	Ext Cations meq/100 Ca	Ext Cations meq/100 Mg	CEC meq/100	% BS	SP	Exch Bases	% MR (Bars) 0.10	% MR (Bars) 0.33	% MR (Bars) 1.0	% MR (Bars) 15	% CaCo$_3$ Eq
Bare gravelly fine sandy	A1	0-6	7.0	7.4	0.18	0.40	0.01	0.02	0.2	0.11	0.06	2.6	2.9	1.2	13.9		37.4	6.5	20.2	15.1	11.5	6.6	1.97
loam BaB2	C1	6-12	7.5	7.9	0.17	0.30	0.02	0.02	0.1	0.08	0.10	3.5	3.4	1.0	15.8		61.3	7.9	20.6	13.5	10.4	6.5	2.31
Location:Area 18 NTS	C2	12-18	7.7	8.5	0.30	0.28	0.006	0.02	0.01	0.006	0.09	5.5	4.8	1.3	15.5		66.7	11.7	21.2	14.2	10.8	7.4	2.49
Survey Hole No.:35	C3sica	18-50+	8.7	8.3	0.34	0.41	0.05	0.12	0.08	0.05	0.37	5.8	5.0	1.3	14.4		59.2	12.1	14.6	11.6	5.2	6.0	5.29
Lab. No.:368-371																							
Beatty gravelly sandy	A1	0-5	7.1	7.7	0.13	0.14	<0.01	<0.01	<0.01	<0.01	0.2	5.9	7.5	1.8	17.1	0.90	42.9	15.4	28.1	14.5	11.4	8.6	2.17
loam BdB2	C1	5-18	7.4	7.8	0.25	0.27	0.01	0.01	0.03	0.01	4.9	5.5	10.2	2.7	21.0	1.10	43.7	23.3	10.9	8.3	8.1	5.3	2.35
Location:Area 18 NTS	C2	18-45	8.2	7.7	0.22	0.28	0.03	<0.01	0.03	0.01	1.4	5.4	10.3	2.2	20.0	0.97	48.8	19.3	21.6	14.4	11.8	3.4	4.32
Survey Hole No.:6	C3	45-60	8.2	7.6	0.32	0.58	0.06	0.02	0.10	0.02	1.5	4.9	9.3	1.7	16.5	1.05	44.5	17.3	21.1	13.1	10.7	8.1	3.81
Lab. No.:246-249																							
Big Butte gravelly	A1	0-3	7.3	7.5	0.24	0.19	0.009	<0.01	0.009	0.006	0.12	1.5	3.4	1.4	14.9	43	525.0	6.4	27.0	16.7	12.5	7.9	1.87
fine sandy loam BdC2	B1	3-10	6.9	7.1	0.12	0.10	0.02	<0.01	0.03	0.01	0.27	0.93	5.5	1.8	21.0	40	49.7	8.5	29.2	20.1	15.4	10.1	2.23
Location:Area 18 NTS	B2	10-13	7.9	8.1		0.48		<0.01	0.05	<0.01	0.60	0.80	11.3	3.1	35.9		44.4		37.8	32.4	24.7	17.6	3.93
Survey Hole No.:26	R	13+																					
Lab. No.:353-356																							
Buckboard sandy	A1	0-3	8.0	7.8	0.20	0.18	0.009	*	0.01	0.006	1.4	1.8	6.3	1.3	17.4	62	390	10.8	17.2	15.4	14.4	5.3	2.38
loam BfC2	B1	3-9	7.4	7.6	0.27	0.43	0.03	-	0.2	0.12	0.23	0.10	9.8	1.2	25.7	43	51.5	11.0	21.4	17.5	15.7	8.5	3.07
Location:Area 18 NTS	C1sica	9-25																	24.9	18.8	16.8	9.5	11.51
Survey Hole No.:14	C2sicam	25+																					
Lab. No.:338, 339, 406																							

Soil	Horizon	Depth (Inches)	pH Reaction Paste	pH Reaction Ext	EC Paste	EC Ext	Sat Ext meq/100 Na	Sat Ext meq/100 K	Sat Ext meq/100 Ca	Sat Ext meq/100 Mg	Ext Cations meq/100 Na	Ext Cations meq/100 K	Ext Cations meq/100 Ca	Ext Cations meq/100 Mg	CEC meq/100	% BS	SP	Exch Bases	% MR (Bars) 0.10	% MR (Bars) 0.33	% MR (Bars) 1.0	% MR (Bars) 15	% CaCo$_3$ Eq
Bullfrog gravelly, cobbly	A11	0-9	8.4	7.7	0.63	0.59	0.005	0.02	0.04	0.01	0.06	4.9	8.2	1.3	24.8	58	54.3	14.5	30.4	20.2	16.7	5.8	3.33
loam BmF2	A12	9-20	8.3	7.8	0.17	0.23	0.01	0.03	0.2	0.09	0.11	3.7	9.0	1.6	26.1	54	52.5	14.1	31.7	22.5	19.4	10.1	3.34
Location:Area 18 NTS	B2	20-40	8.5	8.1	0.25	0.26	0.2	0.04	0.06	0.03	1.5	2.8	16.1	3.6	40.6	53	123.2	21.7	53.4	41.1	36.1	16.3	5.68
Survey Hole No.:13	C2sicam	40+									1.1	1.7	11.0	2.0	29.3								11.65
Lab. No.:334-337																							
Echo gravelly loam	A2	0-3	7.8	7.8	0.23	0.27	0.01	0.01	0.09	0.06	0.23	0.11	5.2	1.6	17.7		43.7		23.9	17.6	12.4	6.6	2.27
EaE2	B1	3-8	7.1	7.8	0.09	0.09	0.02	NT*	0.04	0.01	0.25	0.68	6.7	2.1	21.8		61.3		30.8	22.2	15.2	10.9	2.65
Location:Area 18 NTS	R	8+																					
Survey Hole No.:32																							
Lab. No.:359-360																							
Eleana stony sandy	A1	0-4	7.5	8.1	0.21	0.27	0.01	0.02	0.08	0.04	0.05	1.4	3.7	0.8	13.8		55.3	5.9	24.5	17.0	11.9	6.5	2.09
loam EdF2	B2	4-8	7.5	7.8	0.24	0.25	-	-	-	-	0.09	2.6	5.2	1.7	21.8		72.4	-	26.8	20.7	16.8	11.9	2.39
Location:Area 18 NTS	B3	8-13	7.8	7.8	0.16	0.13	0.02	0.04	0.06	0.02	0.15	2.4	6.7	2.1	25.8		80.4	11.3	29.8	24.2	19.4	15.1	2.69
Survey Hole No.:34	C1sicam	13-48+	8.3	7.8	0.36	0.54	0.08	0.05	0.2	0.14	0.36	1.4	5.7	1.5	17.1		37.4	8.5	15.0	12.7	10.4	7.1	2.27
Lab. No.:364-367																							
Halfpint gravelly	A1	0-5	7.6	7.4	0.25	0.35	0.02	0.08	0.1	0.09	0.07	4.0	2.1	0.6	10.9	60	43.7	6.5	12.3	9.4	8.2	6.5	2.13
loamy sand HcB2	C1	5-48+	8.0	8.4	0.19	0.30	0.02	0.07	0.06	0.04	0.15	5.5	3.3	0.6	11.7	80	51.5	9.4	13.6	9.7	7.9	6.0	2.51
Location:Area 18 NTS																							
Survey Hole No.:16																							
Lab. No.:342-343																							

*No trace

APPENDIX III. Chemical Analysis of Soil Extracts (Continued)

Soil	Hori-zon	Depth (Inches)	pH Reaction Paste	pH Reaction Ext	EC Paste	EC Ext	Sat Ext meq/100 Na	Sat Ext meq/100 K	Sat Ext meq/100 Ca	Sat Ext meq/100 Mg	Ext Cations meq/100 Na	Ext Cations meq/100 K	Ext Cations meq/100 Ca	Ext Cations meq/100 Mg	CEC meq/100	% BS	SP	Exch Bases	% MR (Bars) 0.10	% MR (Bars) 0.33	% MR (Bars) 1.0	% MR (Bars) 15	% CaCO$_3$ Eq
Hampel stony	A2	0-5	8.0	7.7	0.19	0.18	0.01	0.04	0.07	0.02	0.04	1.5	3.8	0.7	12.9		50.6		20.0	13.9	10.2	5.6	2.25
sandy loam HdF2	B1	5-9	7.3	7.8	0.11	0.12	0.03	0.02	0.03	0.02	0.34	2.1	5.5	2.0	23.3		72.4		26.7	20.5	16.2	11.4	2.51
Location:Area 18 NTS	R	9+									0.73	3.0	9.0	2.1	29.0								5.54
Survey Hole No.:44																							
Lab. No.:381-383																							
Indian Springs	A2	0-4	7.1	7.7	0.24	0.27	0.01	<0.01	0.05	0.03	0.11	1.4	6.2	2.2	11.5		30.2	9.8	16.2	11.6	10.1	5.0	2.02
gravelly clay IaC2	B1	4-12	7.5	8.1		0.39	0.04	0.01	0.05	<0.01	0.21	2.3	11.7	3.4	20.9		50.0		27.5	19.8	11.8	10.7	2.84
Location:Area 18 NTS	B2	12-36	7.4	7.8		0.40	0.06	0.01	0.06	0.01	0.34	2.9	15.3	3.7	23.6		59.2		31.9	21.7	18.7	12.7	3.10
Survey Hole No.:30	B3	36-43+	7.8	7.4	0.52	0.38	0.01	<0.01	0.05	0.02	0.28	2.9	13.0	3.1	21.9		53.4	19.2	23.4	16.7	14.1	8.7	3.54
Lab. No.:294-297																							
Keane Spring	A11	0-5	7.5	7.7	0.23	0.40	0.02	0.07	0.2	0.1	0.05	5.3	2.6	0.5	11.9	68	52.4	8.1	12.9	9.7	8.5	7.2	1.97
loamy sand KaB2	A12	5-12	8.9		0.16	0.18	0.01	0.07	0.05	0.02	0.09	6.4	3.1	0.5	12.9	78	54.3	10.0	14.5	10.5	9.4	6.2	2.12
Location:Area 18 NTS	C1	12-40	8.4	8.1	0.21	0.25	0.02	0.06	0.08	0.04	0.13	6.4	4.2	0.5	14.8	74	56.3	11.0	15.6	11.1	9.1	6.3	2.16
Survey Hole No.:24	C2	40+	8.2	8.1	0.27	0.78	0.06	0.01	0.09	0.04	1.1	2.6	2.8	1.0	9.0		33.5						5.61
Lab. No.:345-348																							
Oak Spring fine	A1	0-4	7.5	7.6	0.33	0.58	<0.01	0.08	0.05	0.03	0.04	4.3	3.0	1.8	10.1		42.0	8.9	12.5	9.3	7.9	5.3	2.16
sandy loam OaB2	A2	4-8	7.7	7.4	0.32	0.44	<0.01	0.06	0.04	0.03	T*	0.94	5.8	1.8	12.8		40.4	8.4	13.9	11.1	9.6	5.4	2.17
Location:Area 18 NTS	C1	8-15	7.8	7.1	0.40	0.57	0.02	0.05	0.07	0.02	0.17	4.6	7.2	1.4	16.5		38.9	13.2	16.2	12.7	11.1	7.1	2.64
Survey Hole No.:28	C2	15-44	7.7	7.0	0.63	0.98	0.13	0.04	0.13	0.04	0.96	3.3	8.8	1.8	12.9		40.4	14.7	17.0	12.8	10.0	5.8	3.34
Lab. No.:286-290	B1b	44-60	7.1	7.0	1.9	3.8	0.35	0.06	0.44	0.11	21.0	3.7	11.8	2.4	17.5		49.7		20.5	15.0	11.8	7.8	2.79

*Trace

Soil	Hori-zon	Depth (Inches)	pH Reaction Paste	pH Reaction Ext	EC Paste	EC Ext	Sat Ext meq/100 Na	Sat Ext meq/100 K	Sat Ext meq/100 Ca	Sat Ext meq/100 Mg	Ext Cations meq/100 Na	Ext Cations meq/100 K	Ext Cations meq/100 Ca	Ext Cations meq/100 Mg	CEC meq/100	% BS	SP	Exch Bases	% MR (Bars) 0.10	% MR (Bars) 0.33	% MR (Bars) 1.0	% MR (Bars) 15	% CaCO Eq^3
Pahute gravelly sandy	A2	0-4	6.9	7.6	0.13	0.49	0.004	<	0.005	0.003	0.15	1.4	3.2	1.1	13.6		38.9		23.6	19.5	15.0	7.1	2.20
clay loam PaB2	B1	4-12	7.5	7.4	0.12	0.13	0.03	0.03	0.04	0.02	0.30	2.1	6.5	1.7	23.6		53.4		27.0	20.8	17.4	6.9	2.69
Location:Area 18 NTS	C1sicam	12+									0.87	2.1	11.3	1.1	14.8								
Survey Hole No.:43																							
Lab. No.:379, 380, 403																							
Ruddle gravelly fine	A1	0-4	7.1	7.7	0.27	0.52	<0.01	0.02	0.08	0.02	0.05	2.6	5.3	0.99	9.0		46.2		12.1	8.3	6.9	5.7	1.96
sand RdB2	C1	4-12	7.6	7.7	0.14	0.17	<0.01	0.01	0.04	<0.01	0.11	2.2	4.2	0.69	8.1		39.6		10.9	6.2	5.3	4.2	1.94
Location:Area 18 NTS	C2	12-50+	8.2	8.5		0.51	0.02	0.02	0.06	<0.01	0.36	1.8	4.3	0.72	6.5		39.2						2.12
Survey Hole No.:54																							
Lab. No.:299-301																							
Sawtooth stony	A2	0-4	8.2	8.1	0.27	0.25	0.009	<	0.01	0.005	0.16	2.0	6.5	1.4	18.9		40.4		22.6	20.2	17.6	9.9	2.91
loam SaE2	B2	4-8	8.1	7.8	0.25	0.21	0.03	0.03	0.09	0.02	0.22	2.4	8.0	1.5	24.8		55.3		30.2	24.8	19.8	12.5	2.63
Location:Area 18 NTS	R	8+																					
Survey Hole No.:45																							
Lab. No.:398, 404																							
Scranton stony	A2	0-5	6.9	7.3	0.15	0.16	<0.01	<0.01	0.01	<0.01	0.08	1.7	5.8	2.4	12.9		25.9	10.0	23.0	17.5	17.3	11.2	2.14
fine sandy loam ScE2	B11	5-11	6.8	7.4	0.25	0.15	<0.01	0.01	0.01	<0.01	0.12	3.1	8.3	3.2	17.4		43.7	14.7	23.6	16.2	12.6	11.8	1.51
Location:Area 18 NTS	B12	11-18	7.0	7.4	0.33	0.18	<0.01	<0.01	0.02	<0.01	0.16	3.4	11.2	3.6	20.6		44.5	18.3	25.0	17.1	13.6	9.5	3.94
Survey Hole No.:37	C1si	18-32+	7.5	7.8	0.45		<0.01	<0.01	0.02	0.01	0.39	3.1	12.3	4.1	22.3		48.8	19.8	19.5	14.0	11.9	8.5	3.92
Lab. No.:251, 255-257																							

APPENDIX III. Chemical Analysis of Soil Extracts (Continued)

Soil	Hori-zon	Depth (Inches)	pH Reaction		EC		Sat Ext meq/100				Ext Cations meq/100				CEC meq/100	% BS	SP	Exch Bases	% MR (Bars)				% $CaCO_3$ Eq
			Paste	Ext	Paste	Ext	Na	K	Ca	Mg	Na	K	Ca	Mg					0.10	0.33	1.0	15	
Timber stony	A2	0-6	8.6	8.1	0.41	0.34	0.008	<	0.009	0.005	0.19	3.4	7.7	1.2	21.8		117.4	12.5	23.3	21.4	19.8	12.1	5.83
clay loam TaE2	B1	6-12	8.5	8.3	0.20	0.16	0.01	0.02	0.05	0.02	0.14	2.7	9.5	1.3	27.3		56.3	13.6	29.6	24.6	20.7	13.6	5.55
Location:Area 18 NTS	Clsicam	12+									0.21	3.3	12.6	2.0	32.6								11.6
Survey Hole No.:31																							
Lab. No.:356-358																							
Timpahute gravelly	A2	0-5	7.2	7.4	0.36	0.41	0.02	0.03	0.04	0.02	0.3	2.7	5.0	2.7	13.0	82	36.6	10.7	20.2	13.9	10.4	5.1	1.62
clay TeC2	B2	5-18	7.7	8.3		0.50	0.22	<0.01	0.06	0.01	34.4	4.5	24.6	8.3	55.5		84.2						4.65
Location:Area 18 NTS	Clsicam	18+	8.2	8.5		0.67	0.83	<0.01	0.08	0.02	58.0	2.4	15.0	5.9	38.1		94.2						1.37
Survey Hole No.:19																							
Lab. No.:291, 309, 310																							
Tippipah sandy	A1	0-3	7.1	7.2	0.17	0.16	0.01	0.03	0.03	0.02	0.10	1.7	2.7	1.2	13.9		43.7	5.7	21.4	17.5	13.4	7.4	2.05
clay loam TnC2	A2	3-7	7.5	7.4	0.09	0.18	0.03	0.03	0.08	0.07	0.30	1.7	4.2	1.8	17.7		58.2	7.8	25.5	19.6	15.4	9.9	2.16
Location:Area 18 NTS	B2	7-11	7.5	8.1	0.21	0.10	0.04	<	0.007	0.004	0.44	2.6	7.3	2.5	29.0		66.7	12.8	35.5	29.3	23.5	17.5	2.78
Survey Hole No.:39	Clsicam	11+																					
Lab. No.:376, 377, 378																							
391																							
Wildcat medium	A1	0 3	7.1	7.0	-	0.09	<0.01	<0.01	0.01	<0.01	T*	1.2	2.2	0.74	5.1		38.9	4.1	5.6	4.4	4.0	2.3	1.56
sand WaC2	C1	3-8	7.4	7.3	0.12	0.13	<0.01	<0.01	0.01	<0.01	0.04	0.04	3.2	1.1	6.5		42.9	4.4	6.6	5.4	4.7	3.6	1.91
Location:Area 18 NTS	C2	8-27	6.6	7.3	0.12	0.13	<0.01	<0.01	0.01	<0.01	0.06	0.06	3.8	1.2	8.4		44.5	5.1	8.7	7.3	6.5	5.0	1.08
Survey Hole No.:1	C3	27-36+	7.5	7.1	0.15	-	<0.01	<0.01	0.01	<0.01	0.2	1.7	5.3	1.3	10.4		45.4	8.5	12.3	9.9	9.0	8.1	1.92
Lab. No.:242-245																							

*Trace

APPENDIX IV. AS-4 SOIL SURVEY PROTOCOL

This legend lists and defines the mapping symbols for soil, slope, erosion, and other physical land factors which will be used for soil surveys on the range area of NTS.

Order of Symbols

The land mapping symbol shows soil characteristics, slope erosion, and additional land factors of wetness, salinity, and overflow if significant. Symbols are written in fractional form with soil characteristics in the numerator and slope, erosion, and additional land factors in the denominator. Soil series will be shown by attaching an identifying symbol to the numerator of the fractional symbol.

Delineations

Soil Type and Phase Boundary: Solid black lines.
Land Use Boundary: Dashed lines (1/8")

Symbols for Soil Characteristics

Order of symbols to show soil characteristics is as follows: First, the effective depth, then, the texture; then, the permeability of the upper subsoil; then the permeability of the lower subsoil; finally, the type of underlying material if significant.

Type of underlying material will be shown whenever it limits the effective depth. The permeability of the lower subsoil will be omitted when this is not significantly different from that of the upper subsoil. Permeability of lower subsoil is also omitted when depth symbol is 4. Permeability of both upper and lower subsoil is omitted when depth symbol is 5.

EFFECTIVE DEPTH

Symbol	Range	Descriptive Term
1	Over 60 inches	Very deep
2	36 - 60 inches	Deep
3	24 - 36 inches	Moderately deep
4	12 - 24 inches	Shallow
5	Less than 12 inches	Very shallow

TEXTURE

Symbol	Descriptive Term	Included Texture Classes
H	Heavy	Clay, silty clay
F	Moderately heavy	Sandy clay, silty clay loam
M	Medium	Silt loam, loam, very fine sandy loam
S	Moderately coarse	Fine sandy loam, sandy loam
L	Coarse	Loamy fine sand, loamy very fine sand, loamy sand
C	Very coarse	Fine sand, sand, and coarse sand
X	Undifferentiated	

MODIFIERS OF TEXTURE (Placed before texture symbol)

Symbol	Descriptive Term	Range
g	Gravelly	Limiting crop adaptation and moisture-holding capacity
r	Very gravelly	Enough gravel to prevent cultivation
s	Stony or cobbly	Enough stone to hinder cultivation

PERMEABILITY

Symbol	Class	Approximate Rate (Inches Per Hour)	Probable Texture
2	Slow	.05 - 2.0	H or F
3	Moderately slow	.20 - .80	F or M
4	Moderate	.80 - 2.50	M or S
5	Moderately rapid	2.50 - 5.00	S
6	Rapid	5.00 - 10.00	L
7	Very rapid	More than 10.00	C

TYPE of LIMITING or UNDERLYING MATERIAL

Symbol	Type of Material
V	Lacustrine sediments
R	Lime or lime-silica hardpan
Y	Dense very slowly permeable clay
Z	Gravel

Slope

One set of slope classes will be mapped. In symbolizing slope, slope class letters only will be placed in the fractional symbol. For hummocky micro-topography a double slope class letter will be used.

Slope Class Symbol	Range	Descriptive Term
A	0 - 2 *	Nearly level
B	2 - 4	Gently sloping
AB	0 - 4	Nearly level to gently sloping
C	4 - 8	Moderately sloping
BC	2 - 8	Gently to moderately sloping
DE	8 - 30	Strongly sloping to steep
EF	15 - 45+	Steep to very steeply sloping
AA	0 - 2	Nearly level with hummocks
BB	2 - 4	Gently sloping with hummocks

*Percent of slope

Erosion

Symbol	Descriptive Term
1	No apparent or slight erosion
2	Moderate erosion
4	Very severe erosion
N	Very severe wind erosion (large dunes)

Degree of Wetness

Symbol	Descriptive Term and Range
W1	Moderately well drained: Profile is wet for a small but significant part of the time, usually because of a slowly permeable layer within or immediately beneath the solum, a relatively high or intermittently high water table (usually below 5 feet), surface additions of water by runoff from areas higher up the slopes, or a combination of those conditions. (This class is particularly difficult to assess in drier climates or where winter rainfall occurs when temperatures are low enough to almost inhibit growth.) Evidence includes somewhat thicker and darker A horizons as contrasted to those of well drained soils (grass vegetation), mottling in the lower B horizons or within 36 to 60 inches of the surface or both.
W2	Imperfectly or somewhat poorly drained: Soil is wet for significant periods, but not all of the time, usually because of a slowly permeable layer or a high water table. Field evidences of imperfect drainage are the presence of a water table (at depths of 36 to 60 inches), distinct gleying within 18 to 36 inches of the surface ususually thick and dark A horizons (related to abundant growth of coarser grasses and slower decomposition rates because of wetness), pronouced accumulations of water soluble salts within 36 inches, or a combination of these. Artificial drainage is needed for the growth of most deep rooted crops and many others that are sensitive to poor aeration. Drainage may also be necessary to maintain a favorable salt balance.
W3	Poorly drained: The soil remains wet much of the time with the water table seasonally near the surface for prolonged intervals. Field evidences of poor drainage are the presence of a high water table (at depths of 18 to 36 inches), gleying near the surface (above 18 inches), and pronouced

Symbol	Descriptive Term and Range (Continued)
W3	accumulations of water soluble salts at or near the surface in saline areas. Soils usually lack peaty or mucky surface horizons. Drainage is necessary for the growth of important crops. Grazing is possible most of the time, and hay can usaully be harvested.
W4	Very poorly drained: The water table remains at or near the surface a greater part of the time. Field evidences of very poor drainage are the presence of a very high water table (at depths above 18 inches), a peaty or mucky surface horizon, and gleying at or near the surface (i.e. hues yellower than 10YR and/or chromas of /2 or less and/or distinct discontinuous phase of the pattern). Soils that are very poorly drained due to a moving water table may have oxidized rather than reduced colors because of dissolved oxygen in the water. Drainage is a minimum prerequisite for the growth of important crops. Usually grazing is possible, at least seasonally, and hay may be harvested in drier years.

Salinity

Symbol	Range (% Salt)	Range-Conductivity Saturation Extract (Ec 10^3 A 25°C)	Descriptive Term
No symbol	Less than 0.15	Less than 4	Free
S1	0.15 - 0.35	4 - 8	Slight
S2	0.35 - 0.65	8 - 15	Moderate
S3	0.65 - or greater	15 or greater	Severe

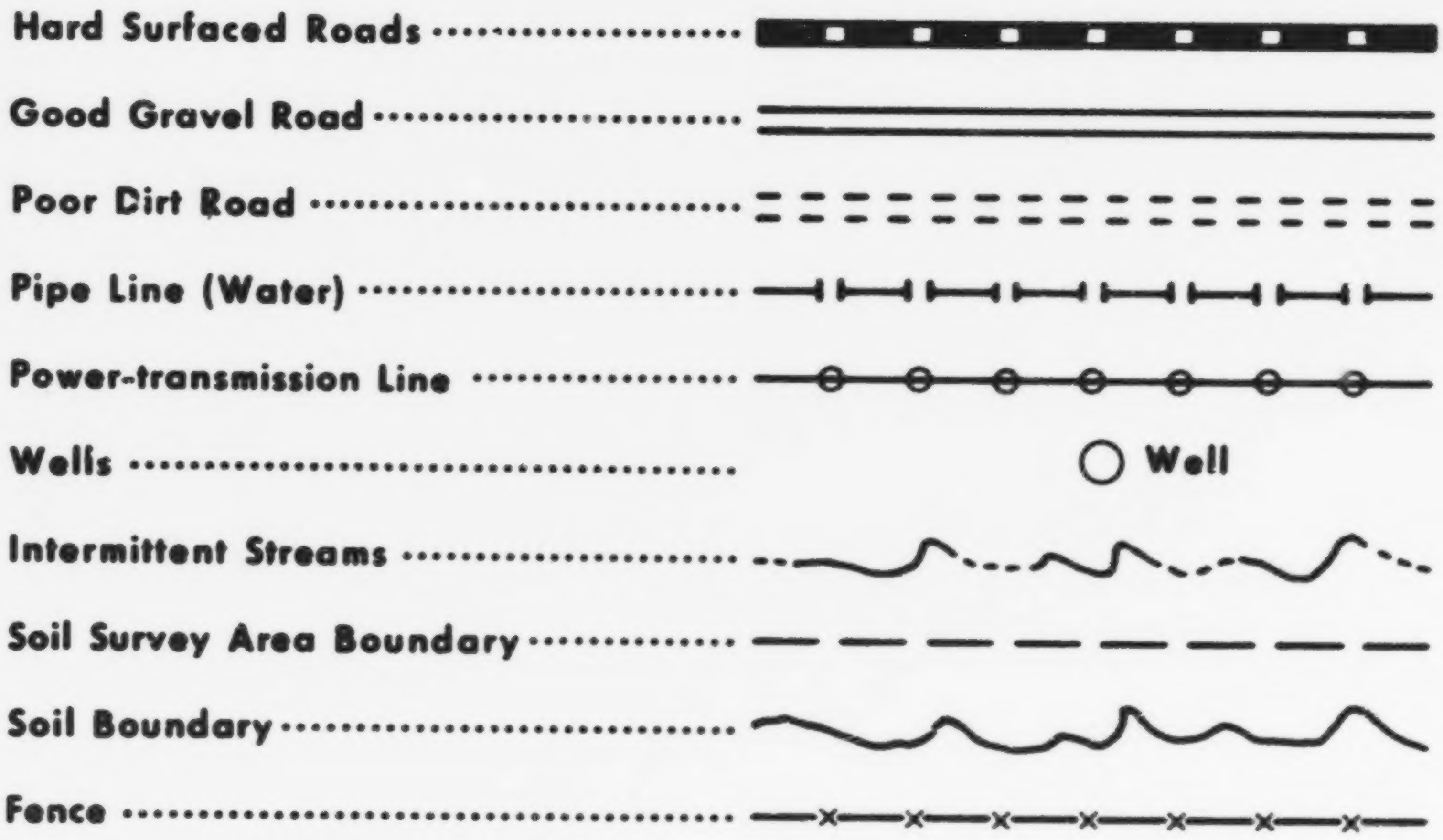
Alkalinity

Symbol	Descriptive Term
No symbol	Free
a1	Slight to moderate
a2	Severe

Overflow

Symbol	Descriptive Term
fl	Occasional overflow

MAPPING SYMBOLS FOR SURVEY FIELD SHEET


Hard Surfaced Roads
Good Gravel Road
Poor Dirt Road
Pipe Line (Water)
Power-transmission Line
Wells
Well
Intermittent Streams
Soil Survey Area Boundary
Soil Boundary
Fence

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY

Mapping Symbol			
New	Old	Mapping Unit Name	Capability Unit
BaB2	1gS5-Ba-AB-2	Bare, gravelly sandy loam moderate erosion 0 to 4 percent slopes	VIIs1
BcB2	1gL6-Be-AB-2	Beatty, gravelly loamy sand moderate erosion, 0 to 4 percent slopes	VIIs1
BdB2	1gS6-Be-AB-2	Beatty, gravelly sandy loam, moderate erosion 0 to 4 percent slopes	VIIs1
BeC2	5gMB-Bb-BC-2	Big Butte, gravelly loam, moderate erosion 2 to 8 percent slopes	VIIs8
BfC2	5gFR-Bc-BC-2	Buckboard, gravelly sandy loam, moderate erosion, 2 to 8 percent slopes	VIIs8
BgC2	5sFR-Bc-BC-2	Buckboard, stony clay loam moderate erosion, 2 to 8 percent slopes	VIIs7
BhE2	5gFR-Bc-DE-2	Buckboard, gravelly sandy clay loam, moderate erosion, 8 to 30 percent slopes	VIIe8

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY (Continued)

Mapping Symbol			
New	Old	Mapping Unit Name	Capability Unit
BkE2	5sFR-Bc-DE-2	Buckboard, stony clay loam moderate erosion, 8 to 30 percent slopes	VIIe8
BmE4	5sFR-Bc-DE-4	Buckboard, stony clay loam severe erosion, 8 to 30 percent slopes	VIIIe
BnF2	2gM3R-Bu-EF-2	Bullfrog, gravelly and cobbly loam deep over hardpan, moderate erosion, 15 to 45+ percent slopes	VIIe8
BoC2	3gM3R-Bu-BC-2	Bullfrog, gravelly and cobbly loam, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8
BpE2	5sFR-Bu-DE-2	Bullfrog, stony clay loam, shallow over silica hardpan, moderate erosion, 8 to 30 percent slopes	VIIIe8
EaE2	5sFR-Ec-DE-2	Echo, gravelly sandy loam, moderate erosion, 8 to 30 percent slopes	VIIe8
EcF2	5sFB-Ec-EF-2	Echo, stony clay loam, moderate erosion, 15 to 45+ percent slopes	VIIe8
EdF2	4sSR-El-EF-2	Eleana, stony sandy loam, shallow over hardpan, moderate erosion, 15 to 45+ percent slopes	VIIe8
HaB2	1C7-Hp-AB-2	Halfpint, loamy sand, moderate erosion, 0 to 4 percent slopes	VIIs1

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY (Continued)

Mapping Symbol			
New	Old	Mapping Name Unit	Capability Unit
HcB2	1gL6-Hp-AB-2	Halfpint, gravelly coarse sand, moderate erosion, 0 to 4 percent slopes	VIIs
HdF2	5sMB-Ha-EF-2	Hampel, stony sandy loam, moderate erosion, 15 to 45+ percent slopes	VIIe8
HeF2	5sFB-Ha-EF-2	Hampel, stony clay loam, moderate erosion, 15 to 45+ percent slopes	VIIe8
IaC2	3gH2R-Is-BC-2	Indian Springs, gravelly clay, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8
KaB2	1L6-Ks-AB-2	Keane Spring, loamy sand, moderate erosion, 0 to 4 percent slopes	VIIck
OaB2	1gL6-Os-AB-2	Oak Spring, gravelly loamy sand, moderate erosion 0 to 4 percent slopes	VIIs
OcB2	1gS6-Os-AB-2	Oak Spring, fine sandy loam, moderate erosion, 0 to 4 percent slopes	VIIs1
PaB2	4gMR-Pa-AB-2	Pahute, gravelly loam, shallow over hardpan, moderate erosion, 0 to 4 percent slopes	VIIs8
PcE2	5gMR-Pa-BC-2	Pahute, gravelly loam, moderate erosion, 2 to 8 percent slopes	VIIs8

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY (Continued)

Mapping Symbol			
New	Old	Mapping Unit Name	Capability Unit
RaE2	5sB-DE-2	Rock land (tuff & basalt material) 8 to 30 percent slopes	VIIIs8
RcF2	5sB-EF-2	Rock land (tuff & basalt material) 15 to 45+ percent slopes	VIIIs8
RdB2	1gL6-Ru-AB-2	Ruddle, loamy sand, moderate erosion, 0 to 4 percent slopes	VIIs1
ReB2	1gS6-Ru-AB-2	Ruddle, gravelly sandy loam, moderate erosion, 0 to 4 percent slopes	VIIs1
RfC2	3g5R-Ru-BC-2	Ruddle, gravelly sandy loam, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs4
SaE2	5sFB-Sa-DE-2	Sawtooth, stony loam, moderate erosion, 8 to 30 percent slopes	VIIe8
ScE2	3sFR-Sc-DE-2	Scranton, stony fine sandy loam, moderate erosion, moderately deep over hardpan, 8 to 30 percent slopes	VIIe8
SdF2	5sFR-Sc-EF-2	Scranton, stony sandy clay loam, shallow over hardpan, 15 to 45 percent slopes moderate erosion	VIIe8
TaE2	5sMR-Tb-DE-2	Timber, stony clay loam, moderate erosion, 8 to 30 percent slopes	VIIe8
TcC2	3gF3R-Ti-BC-2	Timpahute, gravelly sandy clay loam, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY (Continued)

Mapping Symbol New	Mapping Symbol Old	Mapping Unit Name	Capability Unit
TbC2	4gMR-Ti-BC-2	Timpahute, gravelly loam shallow over silica hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8
TdC2	3gH2R-Ti-BC-2	Timpahute, gravelly clay moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8
TeC2	4gFR-Ti-BC-2	Timpahute, gravelly sandy loam, shallow, over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8
TfE2	5sMR-Ti-DE-2	Timpahute, stony loam, moderate erosion, 8 to 30 percent slopes	VIIe8
TgC2	5gFR-Ti-BC-2	Timpahute, gravelly clay loam, moderate erosion, 2 to 8 percent slopes	VIIs8
ThC2	5gFR-Ti-BC-2	Timpahute, stony clay loam, moderate erosion, 2 to 8 percent slopes	VIIs7
TkE2	5sFR-Ti-DE-2	Timpahute, stony clay loam, moderate erosion, 8 to 30 percent slopes	VIIe8
TmC2	3gF3R-Tp-BC-2	Tippipah, gravelly sandy clay loam, moderate deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs8

APPENDIX V. IDENTIFICATION LEGEND FOR AREA 18 OF THE NEVADA TEST SITE SOIL SURVEY (Continued)

Mapping Symbol			
New	Old	Mapping Unit Name	Capability Unit
TnC2	5gMR-Tp-BC-2	Tippipah, gravelly loam, moderate erosion, 2 to 8 percent slopes	VIIs8
WaC2	3L6R-Wi-BC-2	Wildcat, loamy fine sand, moderately deep over hardpan, moderate erosion, 2 to 8 percent slopes	VIIs4

APPENDIX VI. AREA 18 NEVADA TEST SITE SOIL SURVEY

APPENDIX VII. GLOSSARY

ABC soil. A soil that has a complete profile, including an A, B, and C horizon.

AC soil. A soil that has an A and C horizon but no B horizon. Commonly such soils are immature, as those developing from alluvium or those on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but, that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

Aspect (forestry). The direction toward which a slope faces. Synonym: Exposure.

Available moisture capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Badlands. Areas of rough, irregular, denuded land in which most of the surface is occupied by ridges, gullies, and deep channels.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

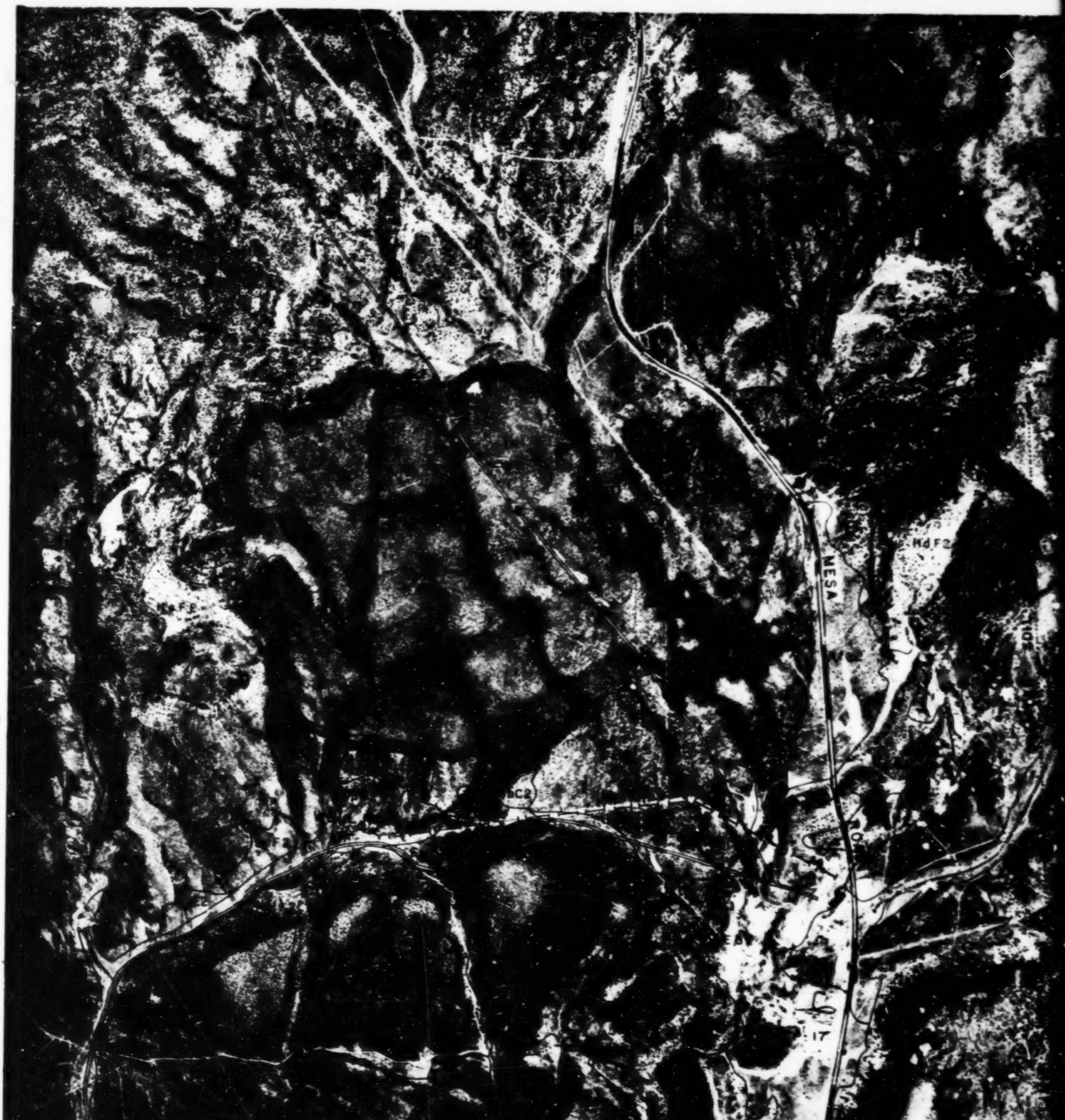
Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperature areas, as in the southwestern states, The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

AREA 18 NEVADA TEST SITE SOIL SURVEY — SHEET NUMBER

(Joins sheet 2)


MESA
HdF2
BC2
17

0 1/2 1 Mile Scale 1: 31680 0 5000 Feet

VEY — SHEET NUMBER 1

①

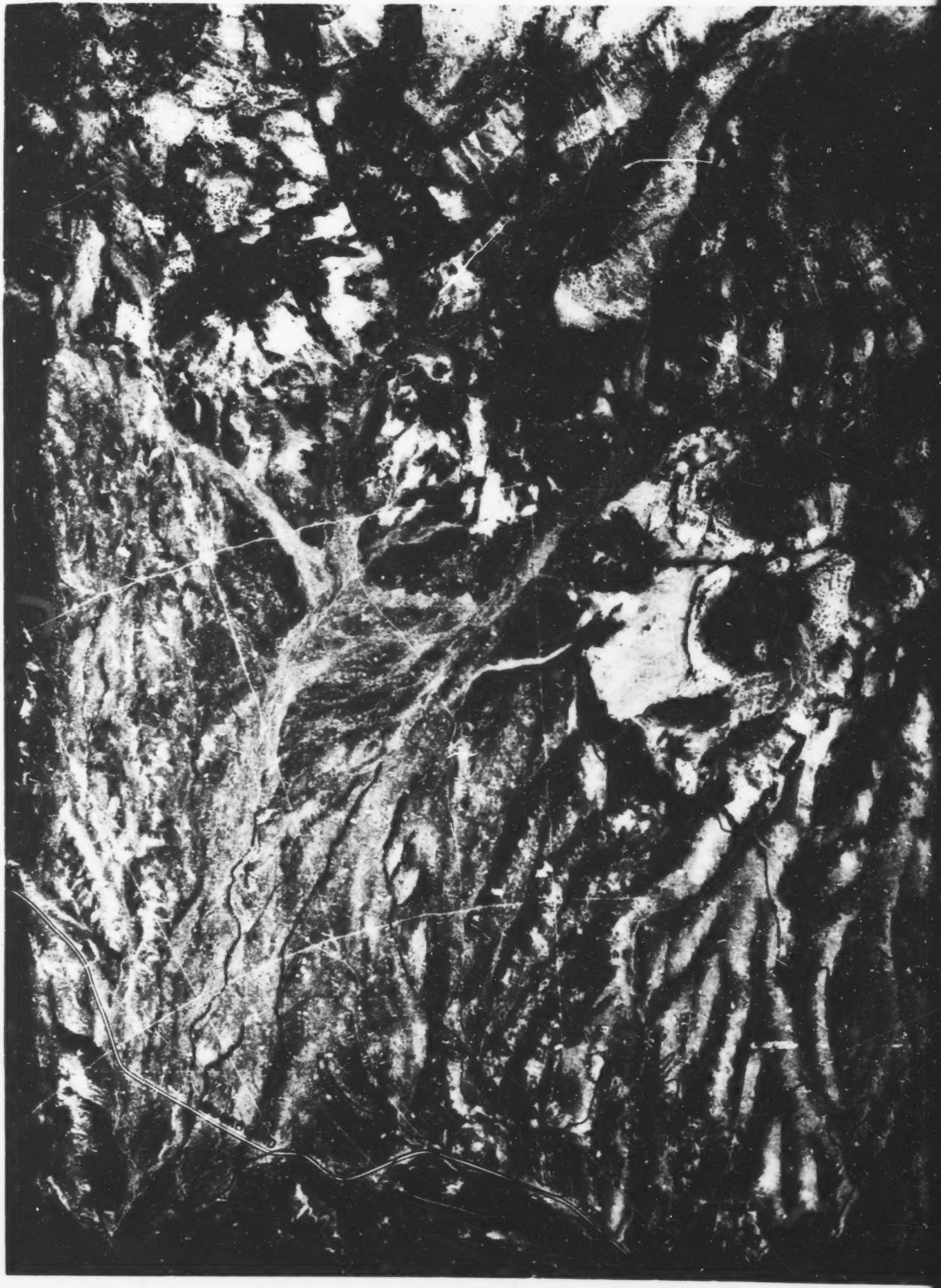
MESA
STOCKADE
N

(Joins sheet 4)

5000 Feet

2

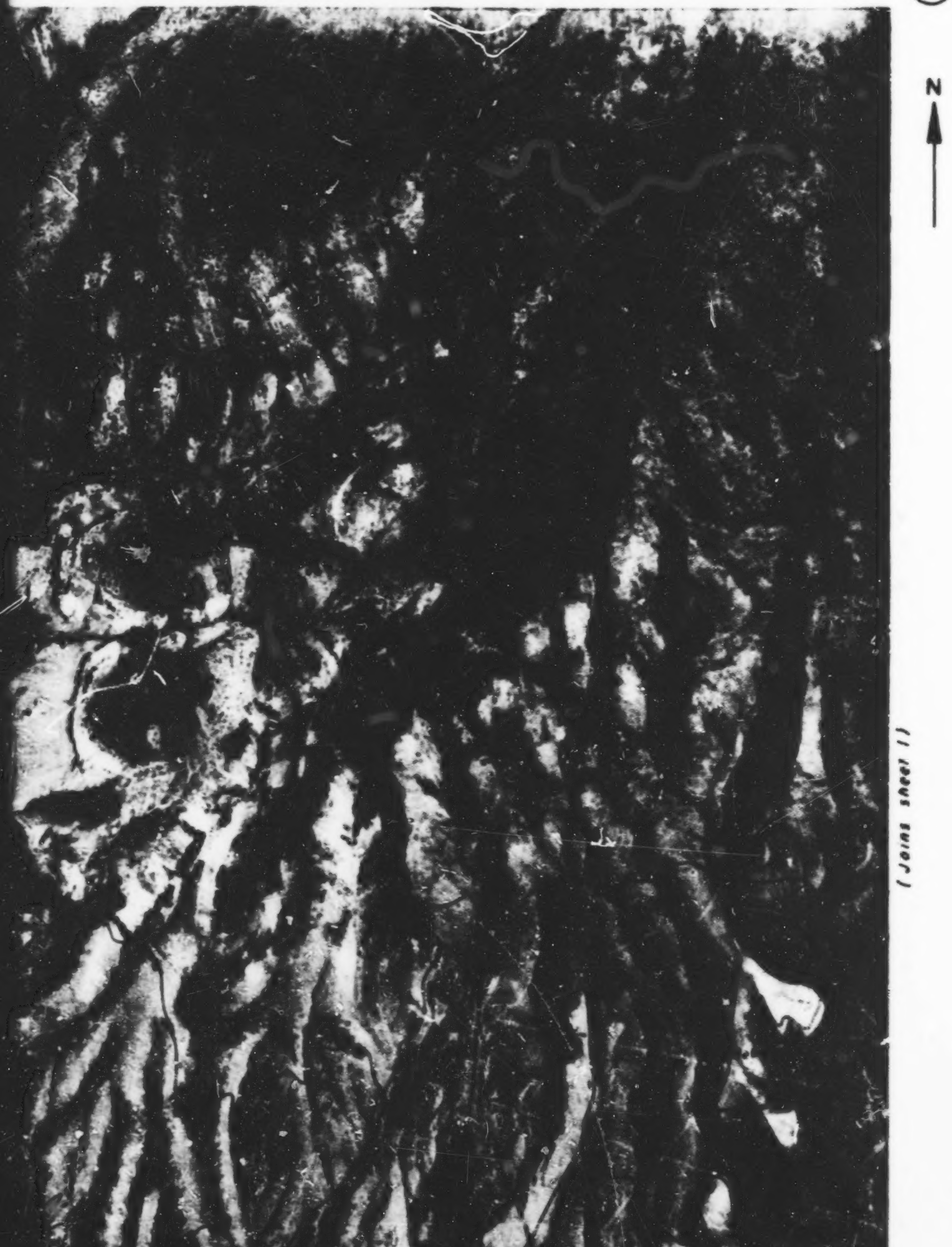
AREA 18 NEVADA TEST SITE SOIL SURVEY — SHEET NUM



0 1/2 1 Mile Scale 1:31680 0 5000 Feet

URVEY — SHEET NUMBER 2

②


N
(Joins sheet 1)
(Joins sheet 3)
5000 Feet

2

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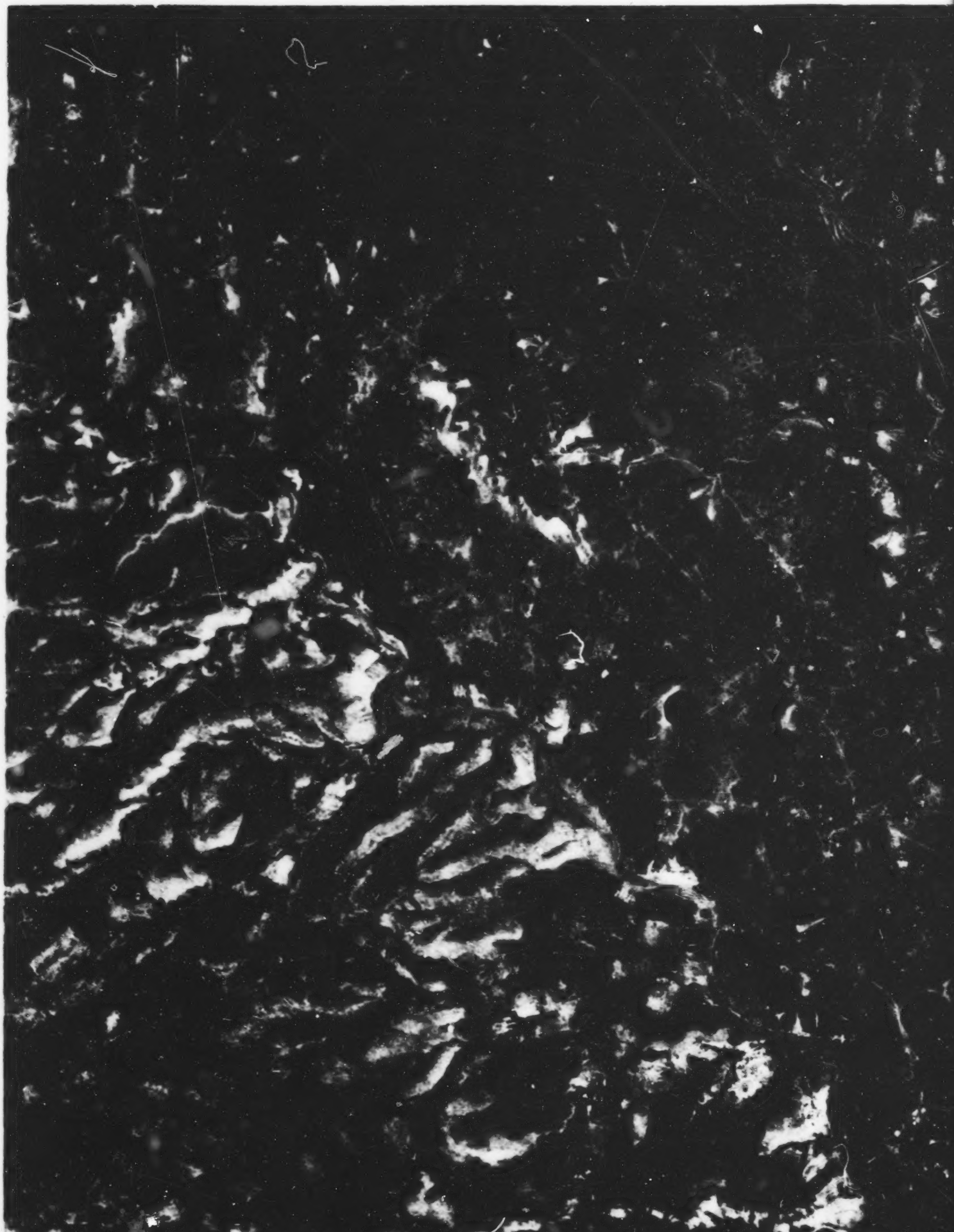
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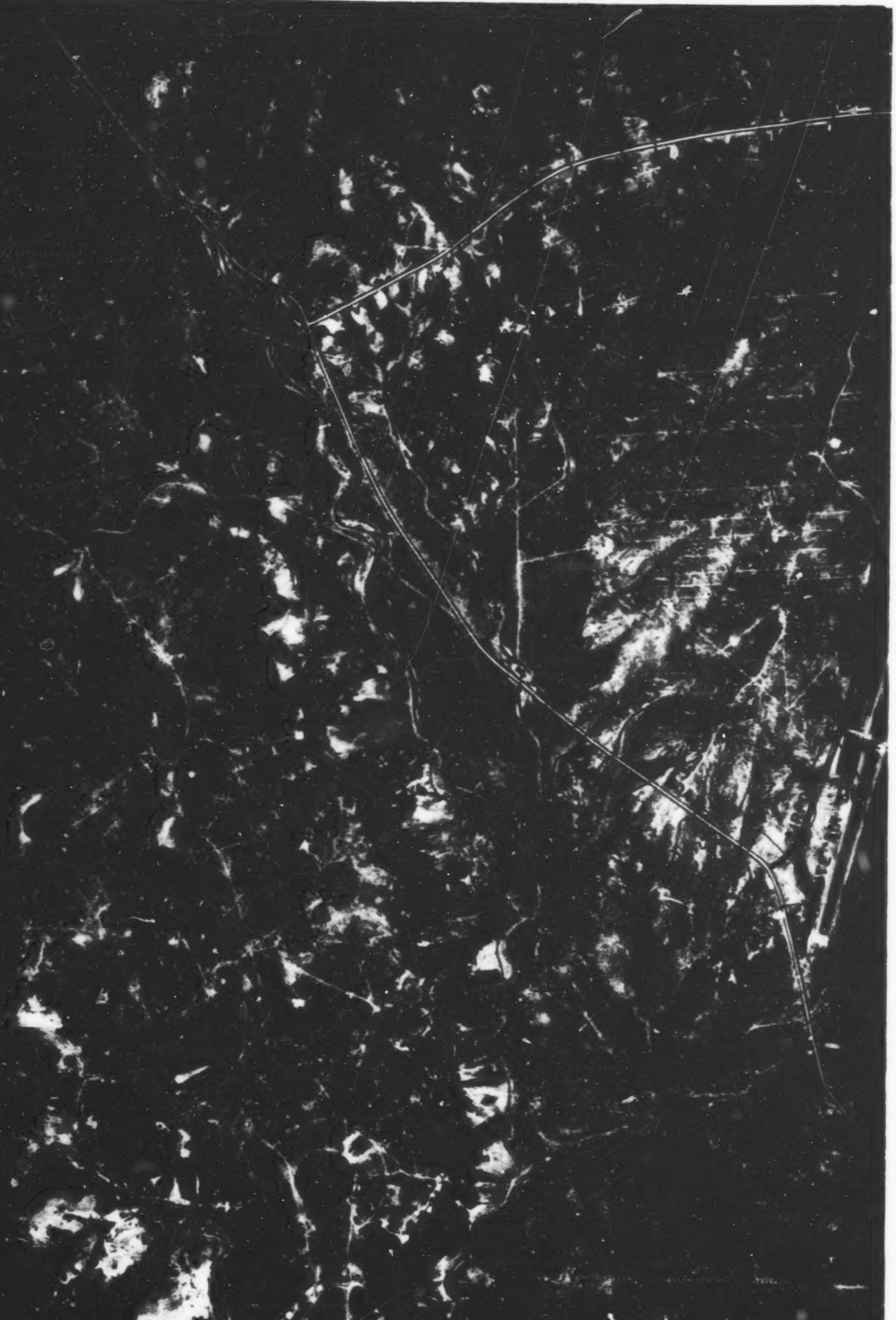
1/2
1 Mile
Scale 1:31680
0
5000 Feet

RVEY— SHEET NUMBER 3

③

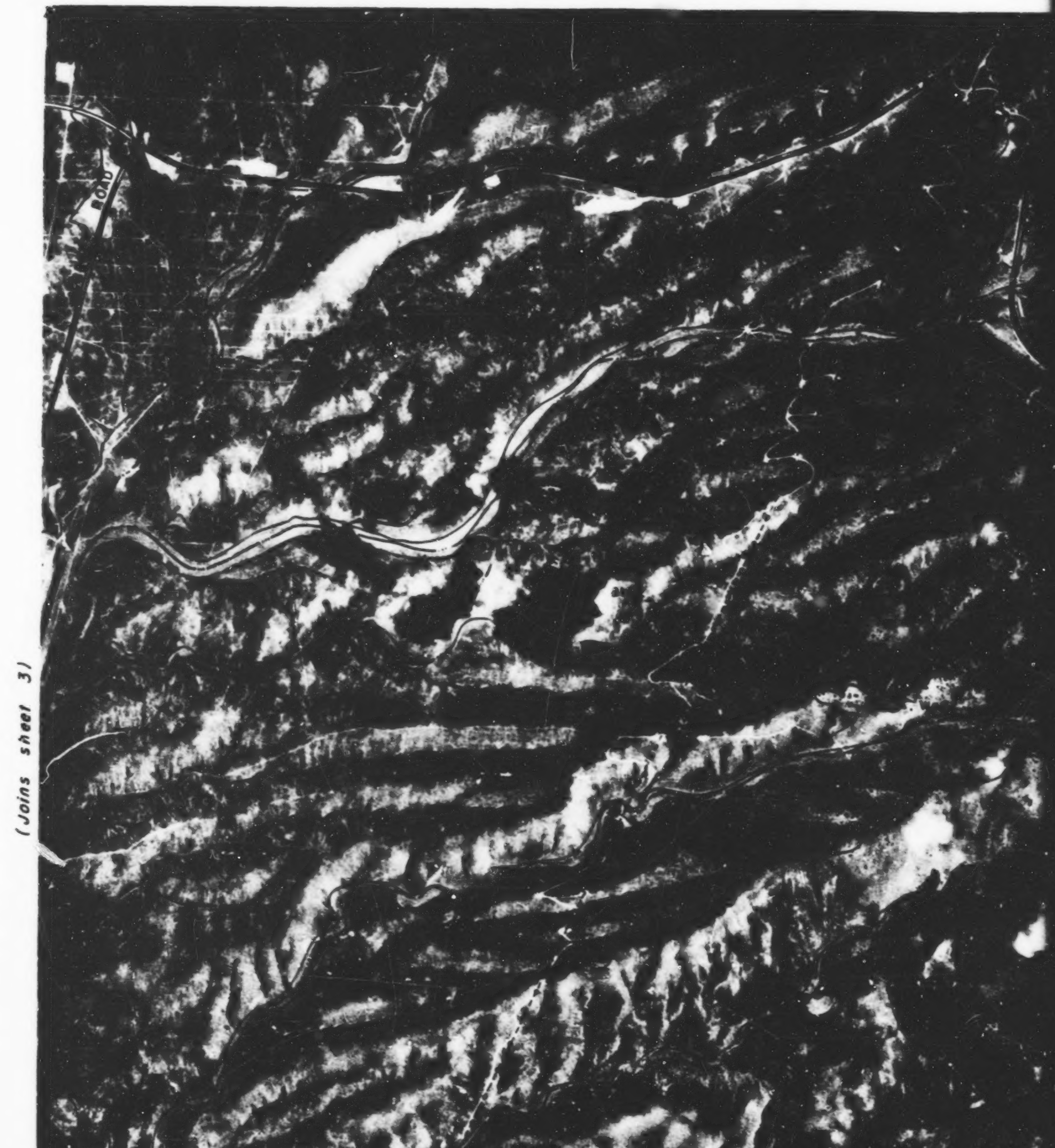
(Joins sheet 2)



(Joins sheet 4)

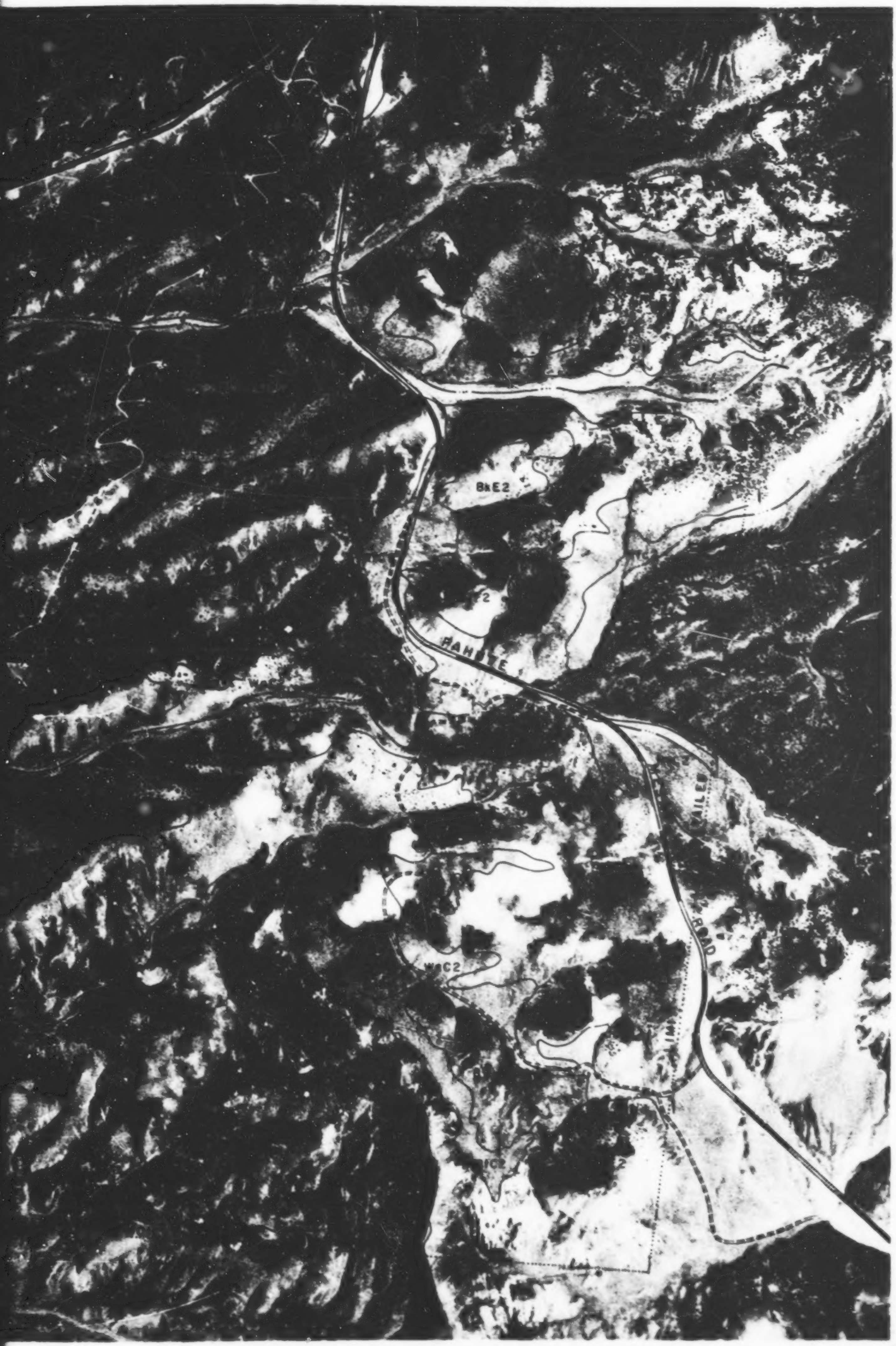
2

AREA 18 NEVADA TEST SITE SOIL SURVEY — SHEET NUMBER 4


ROAD
(Joins sheet 3)
0
1/2
1 Mile
Scale 1:31680
0
5000 Feet

④

(Joins Sheet 1)


N
BkE2
2
PAHUTE
AILER
ROAD
IMI
C2
IC2
2

0 5000 Feet

2

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: Clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Minerals or rock particles more than 2 millimeters in diameter.

Coarse-textured soil. Sand and loamy sand.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are--

Loose. Noncoherent; will not hold together in a mass.

Friable. When moist, crushed easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushed under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between the thumb and forefinger.

Sticky. When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Cemented. Hard and brittle; little affected by moistening.

Continental climate. The climate in areas distant from the ocean; characterized by considerable variation in temperature and in other weather conditions.

Contour. An imaginary line connecting points of equal elevation on the surface of the soil.

Dune. A mound or ridge of loose sand piled up by the wind.

Erosion. The wearing away of land surface by wind, running water, and other geological agents.

Erosion pavement (geology). A layer of coarse fragments of gravel or stones on the surface of the ground, which remains after the fine particles are removed by erosion.

Fine-textured soils. Moderately fine textured: Clay loam, sandy clay loam, silty clay loam; fine-textured; sandy clay, silty clay, and clay. Roughly, soil that contains 35 percent or more of clay.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material that can be used as feed by domestic animals; it may be grazed or cut for hay.

Genesis, soil. The manner in which the soil originated, with special reference to the processes responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Gravelly soil material. From 15 to 50 percent of material by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Grazing capacity. The maximum number of animals or animal units per acre, or acres per animal unit, that a grazing area can support adequately without deterioration; sometimes called carrying capacity.

Gully. A miniature valley with steep sides cut by running water through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage, whereas, a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substances.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. The relative position of the several soil horizons in a typical soil profile, and their nomenclature, are as follows:

A_0 Organic debris, partly decomposed or matted.

A_1 A dark-colored horizon having a fairly high content of organic matter mixed with mineral matter.

A_2 A light-colored horizon, often representing the zone of maximum leaching where podzolized; absent in wet, dark-colored soil.

A_3 Transitional to B horizon but more like A than B; sometimes absent.

B_1 Transitional to B horizon but more like B than A; sometimes absent.

B_2 A usually darker colored horizon, which often represents the zone of maximum illuviation where podzolized.

B_3 Transitional to C horizon.

The A horizons make up a zone of eluviation, or leached zones. The B horizons make up a zone of illuviation, in which clay and other materials have accumulated. The A and B horizons, taken together, are called the solum, or true soil.

Hue. One of the three variables of color. The dominant spectral (rainbow) color; it is related to the dominant wavelength of the light. See Munsell notation.

Igneous rock. Rock that has been formed by the cooling of molten mineral material. Example: Granite, syenite, diorite, and gabbro.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Indicator plants (ecology). Plants that give reliable information concerning present condition and past history of an area as to soil, alkalinity, salinity, climate, depth to water table, overgrazing, fire, and the use to which the area is best adapted.

Inherited soil characteristic. Any characteristic of a soil that results directly from the nature of the material from which it was formed, as contrasted to characteristics that are wholly or partly the result of soil-forming processes acting on parent material. For example, some soils are red because the parent material was red, but the color of most red soils is the result of the soil-forming processes.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level of elevation of the land.

Land. The total natural and cultural environment within which production taken place. Land is a broader term than soil. In addition to soil, it applies to mineral deposits and water supply; location in relation to centers of commerce and population; the size of the individual tracts or holdings; and the existing plant cover works of improvement, and the like.

Land classification. The classification of units of land for the purpose of showing their relative suitabilities for some specific use.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Lime. Chemically, lime is calcium oxide (CaO), but its meaning has been extended to include all limestone-derived materials applied to neutralize acid soils. Agricultural lime can be obtained as ground limestone, hydrated lime, or burned lime, with or without magnesium minerals. Basic slag, oystershells, and marl also contain calcium.

Lime concretion. An aggregate cemented by the precipitation of calcium carbonate ($CaCO_3$).

Mechanical analysis (soils). The percentage of the various sizes of individual mineral particles, or separates in the soil. Also a laboratory method of determining soil texture.

Medium-textured soil. Soil of very fine sandy loam, loam, silt loam, or silt texture.

Mica. Primary alumino-silicate minerals in which two silica layers alternate with one alumina layer. The layers separate readily into thin sheets or flakes.

Micro-organisms. Forms of life that are either too small to be seen with the unaided eye or are barely discernible.

Montmorillonite. A fine, platy, alumino-silicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when moist.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color and other physical, chemical, mineralogical, and biological properties of the various horizons that make up the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows:

Abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct, and prominent. The size measurements are these: fine less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter, along the greatest dimension; and coarse, more than 15 millimeters (about 0.5 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables--hue, value and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, value of 6 and a chroma of 4.

Natural drainage. Refers to moisture conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Several different classes of natural drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat exressively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well-drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Neutral soil. In practice, a soil having a pH value between 6.6 and 7.3. Strictly speaking, a soil that has a pH value of 7.0.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

Organic soil. A general term applied to a soil or to a soil horizon that consists primarlly of organic matter, such as peat soils, mulch soils, and peaty soil layers. In chemistry, organic refers to the compounds of carbon.

Pan. A layer in a soil that is firmly compacted or very rich in clay. Frequently the word "pan" is combined with other words that more explicitly indicate the nature of the layers; for example, hardpan, fragipan, and claypan.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block in contrast to a clod.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

pH. A numerical means for designating relatively weak acidity and alkalinity, as in soils and other biological systems. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; an and a lower value, acidity.

Phase soil. A subdivision of a soil type, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness or some other characteristic that affects management.

Physical properties of soils. Properties related to or caused by the forces and operations of physics.

Plastic (soil consistence). Capable of being deformed without being broken.

Plastic limit (soil engineering). The moisture content at which a soil changes from a solid to a plastic state.

Precipitation-effectiveness (P-E) index. The sum of the 12 monthly quotients of precipitation divided by the evaporation during the 12 months.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land on which there are some forest trees.

Range condition. The state of health or productivity of both soil and forage in a given range, in terms of what it could or should be under normal climate and the best practical management. Condition classes generally recognized are--excellent, good, fair, and good. The classification is based on the percentage of original, or climax, vegetation on the site, as compared to what ought to grow on it if management were good.

Range plant cover. All the herbaceous and shrubby plants on a range that livestock can reach, regardless of whether these plants constitute forage.

Range site. An area of range where climate, soil and topography are sufficiently uniform to produce a distinct kind of climax vegetation.

Range survey. A systematic, comprehensive inventory and analysis of the range resources and the related problems of management, in a range area, and development of plans for its management.

Range type. An area of range differentiated from other range areas primarily by its kind of plant cover, such as grass, browse, or conifer.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid or alkaline. In words the degrees of acidity or alkalinity are expressed thus:

Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	above pH 9.0

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Ridge terrace. A long, low ridge of earth that has gently sloping sides and a shallow channel along the upper side; controls erosion by diverting surface runoff across the slope instead of allowing it to flow uninterrupted down the slope. Compare with Bench terrace.

Rolling. Having moderately steep, complex slopes; intermediate between undulating and hilly.

Root zone. The part of the soil that is penetrated, or can be penetrated by plant roots.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Sandy soils. A broad term for soils of the sand and loamy sand classes; soil material with more than 70 percent and less than 15 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate from gravel, sands one from sand; shale from clay; and limestone from soft masses of calcium carbonate. There are many intermediate types. Some wind deposited sands have been consolidated into sandstone.

Semi-arid climate. A climate intermediate between that of a true desert and a subhumid area.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the profile.

Sesquioxides. Oxides having trivalent cations, as iron or aluminum oxides.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Sheet erosion. The removal of a fairly uniform layer of soil or material from the land surface by the action of rainfall and runoff water.

Silica. An important soil constituent composed of silicon and oxygen. The essential material in the mineral called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina plus iron oxide in a soil or the clay fraction of a soil. The more highly weathered materials in warm-temperate humid regions and especially those in the tropics, generally have low ratios. The clay in soils with low ratios normally are less active, physically and chemically than those with high ratios.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil map. A map designed to show the distribution of soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

Very coarse sand (2.0 to 1.0 millimeter); coarse sand (1.0 to 0.5 millimeter); medium sand (0.5 to 1.25 millimeter); fine sand (0.25 to 0.10 millimeter) very fine sand (0.10 to 0.05 to 0.002 millimeter); and clay (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeters); II (0.2 to 0.02 millimeters); III (0.02 to 0.002 millimeters); IV (less than 0.002 millimeter).

Soil survey. A systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified accordingly to intensity of field examination as exploratory, reconnaissance, or detailed.

Solum (pl. sola). The upper part of a soil profile, above that parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stones. Rock fragments greater than 10 inches in diameter if rounded. and greater than 15 inches along the longer axis if flat.

Stony. Used to describe soils that contain stones in numbers that interfere with or prevent tillage.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soil that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separate from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are platy, (laminated), prismatic, (vertical axis of aggregates longer than horizontal), columnar, (prisms with rounded tops), blocky, (angular or subangular), and granular. Structureless soils are (1) single grain (each grain by itself as in dune sand) or (2) massive (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or D horizon.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed-across sloping soils a the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces intended mainly for drainage have a deep channel that is maintained in permanent soil. See also broadbase terrace, narrowbase terrace, bench terrace.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating bordering a river, lake, or the sea. Stream terraces are frequently called second bottom, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements found in soils in extremely small amounts, yet which are essential to plant growth. Some of the trace elements are zinc, cobalt, manganese, and copper. Synoynm: Minor elements.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Value (color). One of three variables of color. Value increases as the relative intensity of reflected light increases. See Munsell notation.